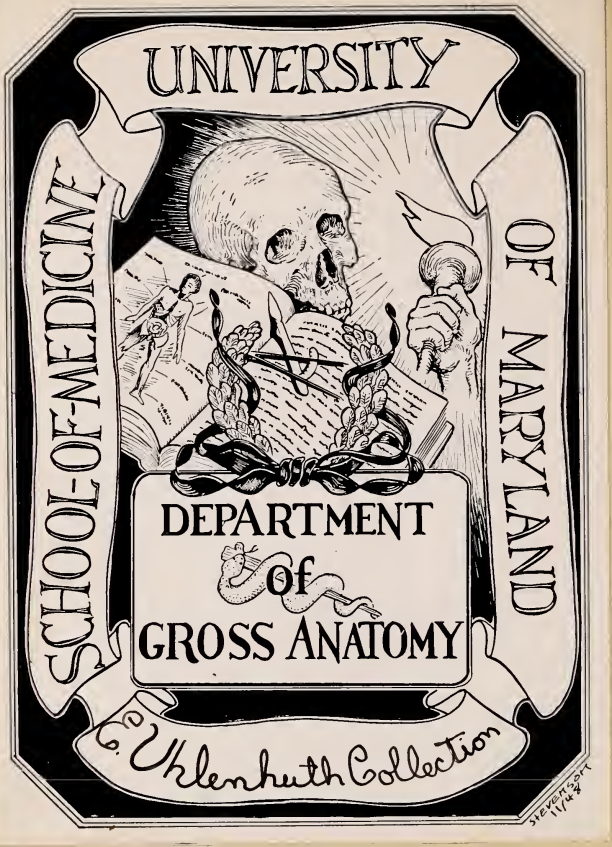
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A Duverney, Guichard Joseph

A TREATISE OF THE *Organ of Hearing:*

CONTAINING

The STRUCTURE, the USES,

AND

The DISEASES of all the Parts of the EAR.

Tranſlated from the *French* of the late

MONSIEUR *DU VERNEY,*

Of the Royal Academy of SCIENCES, Counſellor Phyſician in Ordinary to the late King of *France,*

And Profeſſor of *Anatomy* and *Surgery* in the ROYAL PHYSICK-GARDEN at *Paris.*

Adorn'd with Sixteen Curious Copper-Plates.

LONDON:

Printed for SAMUEL BAKER, at the *Angel* and *Crown* in *Ruſſel-Street, Covent-Garden.* MDCCXXXVII.

1st Ed 1683.

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TO

Mr. FREKE
Mr. PHILLIPS
Mr. BIGG
} Surgeons to St. *Bartholomew's* Hoſpital.

GENTLEMEN,

WHATEVER tends to the Benefit of Mankind in general, has no need of an Apology to introduce it to the World; and the more exenſive the Benefit is, the more valuable the Work muſt be. Now as there is no Art or Science but what in ſome manner conduces to this End, ſo that parti-

cularly which frees us from Pain and Sickness, must certainly be of the most universal Advantage, and consequently merit the greatest Encouragement. Anatomy and Surgery are of this kind; the one may be said to be the Theory, the other the Practice, which like two neighbour Stars mutually reflect Light upon each other. The Knowledge therefore of our own Bodies, and an inquisitive Search into the Organs of our Senses, is not (as some idly imagine) a Matter meerly of Curiosity and Speculation. 'Tis this Knowledge, Gentlemen, which has so particularly distinguish'd you, and plac'd you in the Rank of the most Eminent in the Profession. I might here, like most Dedicators, though with infinitely more Truth and Justice, enlarge abundantly upon your great Abilities, and other shining Virtues, which serve to dignify your Characters; but that there is no need of a Pen to testify what is so loudly proclaim'd by the Tongues of Thousands

sands of poor Wretches, who owe their Lives as well as their Eaſe to that Skilfulneſs, Care and Humanity, the happy Influence of which they daily experience, and which I my ſelf am frequently an Eye-Witneſs of. 'Tis upon this account, Gentlemen, and not upon any Preſumption of my own Merit, that I am embolden'd to prefix your Names to this Tranſlation; not only as a means of recommending it to the World, but as an acknowledgment of that Reſpect and Duty, which I ſhall always retain a grateful Senſe of, and particularly of the many Favours and Obligations which are continually conferr'd upon me, by my worthy Maſter Mr. *Phillips*.

Nothing need be ſaid in praiſe of the Author; this Treatiſe has gain'd him ſufficient Applauſe from the moſt accurate Anatomiſts: But as for this Tranſlation (which I have endeavour'd to render as literal as poſſible) I ſubmit it entirely

ly to your candid Judgments, ho
ping you'll excuſe thoſe Errors th
may have eſcap'd me: And be
leave to ſubſcribe my ſelf,

Gentlemen,

Your Oblig'd

Humble Servant,

JOHN MARSHALL

THE

THE

AUTHOR's *Advertisement.*

OF all the Organs assign'd to the Use of Animals, we have the least Knowledge of those of the Senses; but there is none more obscure than that of Hearing: the Minuteness and Delicacy of the Parts which compose it, being inclos'd by other Parts, (which by reason of their Hardness, are scarcely penetrable) render the Enquiries into them more difficult, and their Structure something so intricate, that there is as much Trouble in explaining, as there was in discovering them. It is easy to judge

judge how little known they were to the Ancients, by what they have wrote upon this Head: And amongst the Moderns, Mr. *Perrault*, who in his *Physical Essay*, has treated it with more Exactness and Perspicuity than any one yet, nevertheless has omitted many things on this Subject, applying himself to those particular Parts which serve for the better Explanation of the Nature of Sound, by the Organs of that Sense of which it is the Object. And this is what has induced me to write upon this Matter.

Altho' I don't pretend that this Work is entirely perfect, yet I am in hopes there may something more be found in it, at least, than hath been describ'd before; for I have endeavour'd (by all the necessary Precautions I cou'd take, to avoid the Obscurity which is to be met with in most Authors, that I have read upon this Subject,) not only to give an exact and compleat Description of all the Parts belonging to the

Ear,

ar, but alſo to make that De-
ription as plain and intelligible, as
uch as poſſible: To attain which,
have ſpar'd no Pains, but have
arch'd with all the Care and Pa-
ence imaginable, into the moſt
inute Parts, examining their Sub-
ance, and their Figure, with a
ontinual Apprehenſion of forget-
ng ſome Things, or miſtaking one
or the other.

For to make this Treatiſe more
ntelligible, I have been very care-
l and exact in the Figures, which
re particularly neceſſary to render
heſe ſort of Deſcriptions neat: And
ecauſe it is not enough that theſe
igures ſhould be true and faith-
lly delineated, if they were not
eſides order'd and diſpos'd in ſuch
manner, that they may leave no
oom for Ambiguity; I have re-
reſented the Parts of the right Ear
lways in their natural Situation,
o preſerve the firſt Ideas that they
mprint upon the Mind, that they
nay not be confus'd nor deſtroy'd

by one another. And becauſe
often happens, that in ſeeing th
ſame Parts in various Views, w
miſtake them for different Parts
I have left certain remarkable Part
which are eaſily known again, ſuc
as the *Proceſſus Zygomaticus*, *Mam*
millaris, and *Styloides*, and the bo
ny Paſſage of the Ear, to ſerve a
an Index to the Reader, and whic
will be his ſureſt Guide in his En
quiry into the Part which he ex
amines. In ſhort, that I might nc
omit any thing which I though
belong'd to the Subject which
treated of, I have added the De
ſcription of the Ear of a *Fœtus* t
that of the Ear of an *Adult*, where
in I have taken notice of all the Dif
ference I ever met with between th
one and the other.

As for the uſe of ſome Parts o
this Organ, I muſt confeſs that eve
ry thing that I have ſaid of then
does not entirely ſatisfy me, n
more than what others have wrot
upon this Subject; I don't equall

aſſer

aſſert the Truth of thoſe particular Things which were diſcover'd before me: As for thoſe I have found out my ſelf, they are things which I maintain to be true, which I have many times experienc'd upon a great Number of Subjects, and which I promiſe to demonſtrate plainly to all thoſe who ſhall have the Curioſity to inform themſelves.

As I have reſolv'd to give a Deſcription of all the Organs of Senſe, and ſince it is abſolutely neceſſary to determine what is the Origin of their Nerves; I have been obliged to make a new Plate of the Baſis of the Brain, not being able to make uſe of any of the Figures that have hitherto appear'd, not even thoſe of Mr. *Willis*. I have ſaid nothing of the Senſes, nor of Senſation in general, becauſe I thought it neceſſary to know firſt the Structure of their Organs. I ſhall defer ſpeaking of them, till I have finiſh'd a particular Deſcription of all the Senſes, and

in

in the Interim I ſhall give you the anatomical Uſe.

I finiſh this Volume with a little Treatiſe of the Diſtempers of the Ear and their Cure, which muſt be look upon as an Eſſay, I ſhall endeavour to perfect it by the different Obſervation, which I may have an opportunity of making.

ERRATA.

Pag. 22. Line 6. for Plate IX. Fig. 11. read Plate IX. Fig. 1. Pag. id. Line 15. for *Feneſtr.* read *Feneſtra.* Pag. 26. Line 6. after *ſide,* read *next to the Aqueduct.* Pag. 27. Lin. 12. for *Incu* read *Stapes.* Pag. 32. Lin. 10. for *dedcrib'd* read *deſcrib'd.* Pag. 41. Lin. 12. for *there* read *theſe.* Pag. 54. Lin. 5. after *no* read *other.* Pag. 57. Lin. the laſt, for *upper* read *under.* Pag. 61. Lin. 6. after *fix'd* add *in Adults.* Pag. 62. Lin. 4. for *Inferior* read *Superior.* Pag. 106. Lin. 2. for *Yol.* read *Oil.* Pag. 109. Lin. 15. after *Ears* read *alſo the Blood which comes out of 'em from Wounds in the Head.* Pag. idem. Lin 27. after *Blood* read *which are at the* Baſis *of the* Cranium. Pag. 110. for *I do find,* read *I don't find.* Pag. 118. Lin. 7. after *conſiſts in* read *Extracting.* Pag. 139. Lin. 27. after *Particles* read *mov'd.*

OF THE
ORGAN
OF
HEARING.

PART I.

Containing the Structure of the Organ *of* Hearing.

THE Ear itself without being dissected is divided into two Parts, that which appears externally from the Head, and is properly called the Ear; and that which sunk into the Head, and is call'd the ole of the Ear, or the Auditory Passage.

The External Part of the Organ of Hearing, called only the Ear.

Is compos'd The Ear is form'd of a pretty thic Cartilage, which is cover'd with a thi tender Skin, ſtor'd, eſpecially in youn Subjects, with a little Fat; under which found another Nervous Covering, whic ſtrictly adheres to all the Cartilage.

Of a Cartilag. This Cartilage commonly conſiſts many Foldings, which are continued an terminate in a Cavity call'd the *Co cha*, from its Reſemblance to the E trance of a Snail-ſhell. The Winding or Folds of this Cartilage are more diſtin in Adults, and their Figure is often var

Of Skin, of Fat, of a nervous Membrane, ed. Beſides the Skin, the Cartilage, t Nervous Membrane, and the Fat, t Ear is furniſhed with ſome Muſcles, a adorn'd with Arteries, Veins, and Nerve

Of two Muſcles. It has two Muſcles, the firſt conſiſts fleſhy Fibres, which are fix'd to th part of the Skull which the *Muſculus Te poralis* covers; they deſcend in a ſtra Line, and are inſerted into the ſuperi Part of the ſecond Fold of the Ear: T ſecond is alſo compoſed of five or fleſhy Fibres, which take their Orig from the ſuperior and anterior Part the *Proceſſus Mammillaris*, they deſcer obliquely about the Length of an Inc and are inſerted into the Middle of t *Concha*. See *Plate* I. *Fig.* I. and II.

Expl

Fig. I.

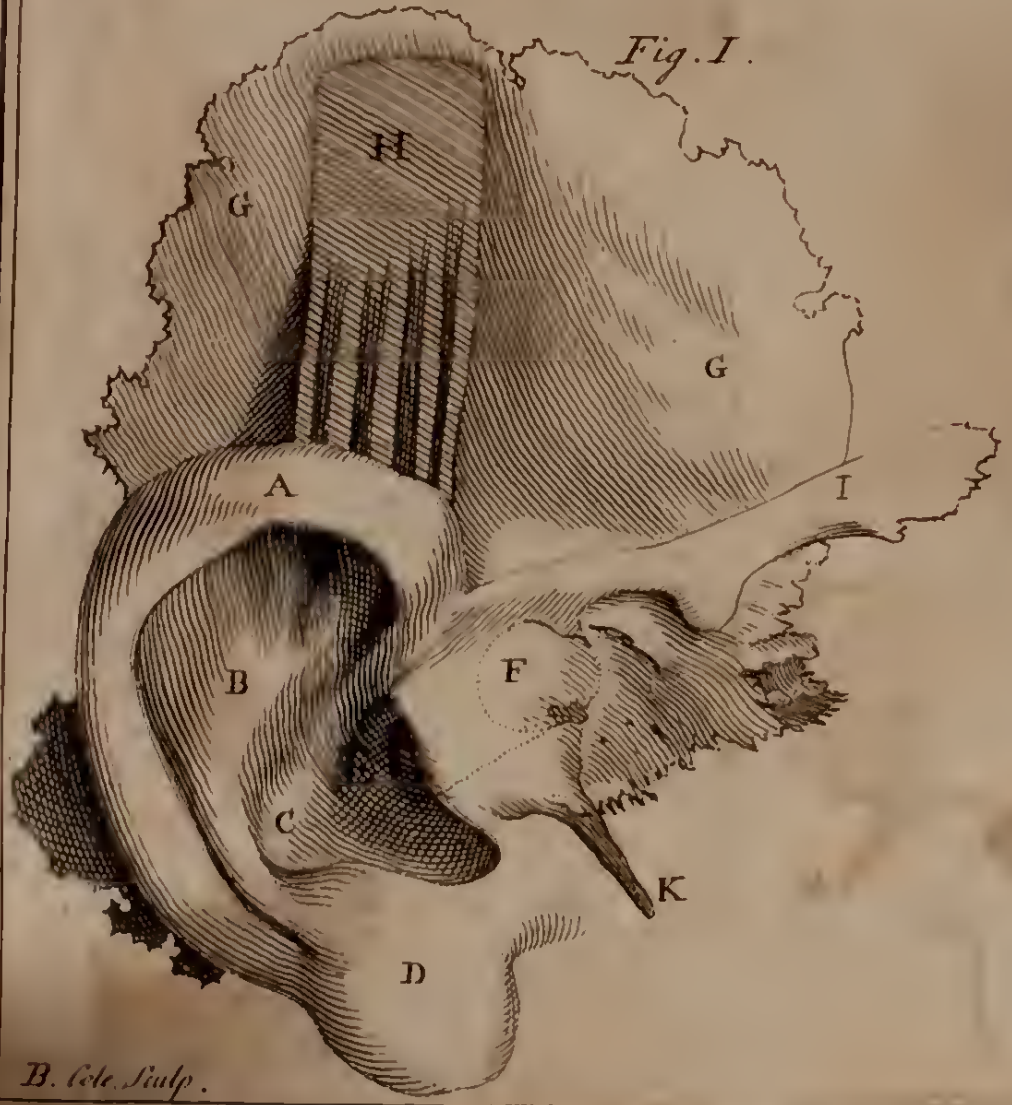
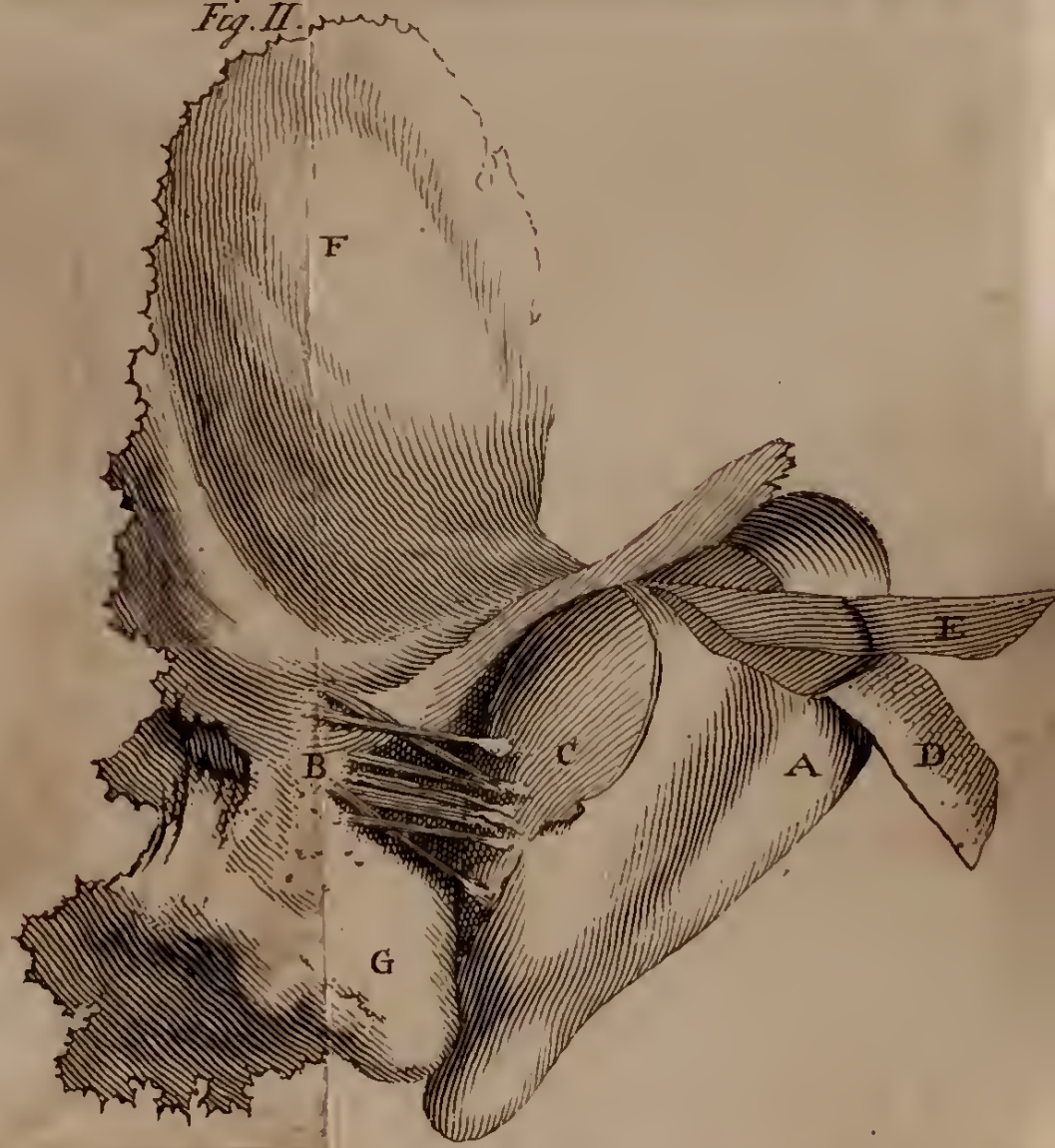
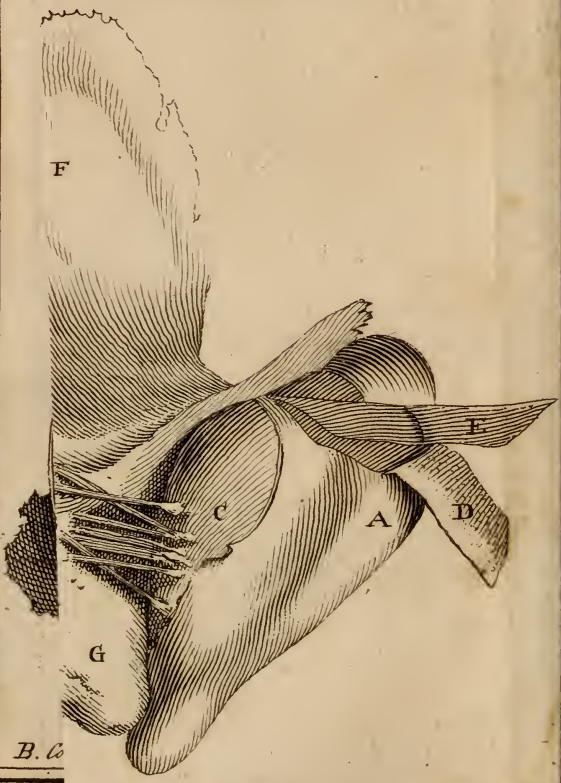


Fig. II.



B. Cole Sculp.

Plate I.



Explanation of Plate I.

Fig. I. *repreſents the Ear in its natural ſituation.* A B C D, *the Ear.* A B C, *its three Folds.* D, *the End of the Ear.* E, *the* Concha, *near* E *the Orifice of the Audiory Paſſage is ſeen.* F, *the Scituation of the* Tympanum. *The two dotted Lines ſhew the Length of the Paſſage.* G G, *the ſcaly Part of the Temporal Bone ſhewn bare.* H, *the firſt Muſcle, which is here repreſented as lying upon the ſcaly Part of the* Os Temporale, *becauſe it is diveſted of the Temporal Muſcle, upon which the Muſcle belonging to the Ear is naturally ſcituated.* I, *the* Proceſſus Zygomaticus. K, *the* Proceſſus ſtyloides.

Fig. II. *repreſents the Ear revers'd, to ſhew its ſecond Muſcle and its Integuments.* A, *the Ear revers'd.* B, *the ſecond Muſcle of the Ear, whoſe Fibres have been diveſted of their Membranes, to render their Origins and Inſertions the more diſtinct.* C, *the Place where the ſecond Muſcle is inſerted, ſtript of the Skin.* D, *the Skin of the Ear, ſtor'd in the lower Part with a little Fat.* E, *the Nervous Membrane.* F, *the Scaly Part.* G, *the* Proceſſus Mammillaris.

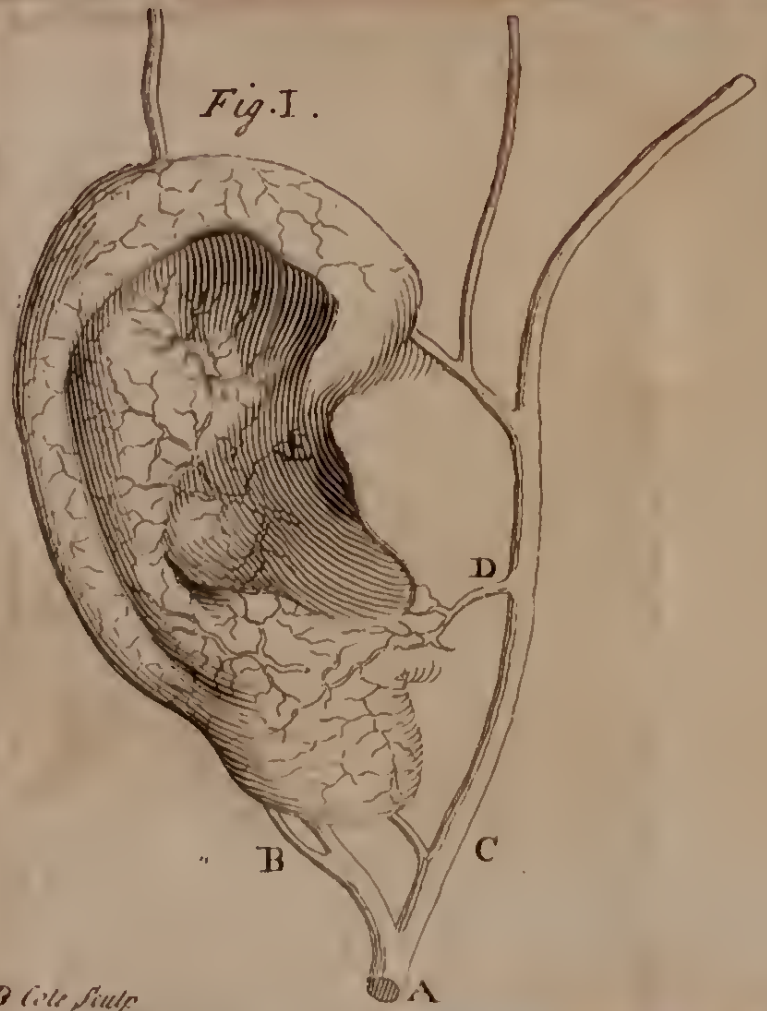
Of Arteries. The Arteries are Branches of the ex
ternal Carotid, which after part of ther
being distributed to the *Larynx*, and t
many Parts of the Face, are divided nea
the Articulation of the *Maxilla* into tw
other Branches; one of which passes ove
the fore-part of the Ear, and the othe
over the back-part. That Branch whic
passes behind the Ear, sends off many littl
Ramifications, and is dispers'd all ove
the back Part of the Ear: One of th
most considerable of these Ramification
enters the Ear near the Auditory Passage
and is afterwards distributed into a grea
Number of small Branches, which ar
expanded over the Skin, which lines th
Inside of the *Concha*.

That Branch which passes over th
fore-part of the Ear, is that which is pe
ceiv'd to beat at the Temples, and whic
is commonly open'd for great Pains in th
Head. In passing it is divided into mar
lesser Branches, which sprinkle the Ca
tilaginous Passage; and continuing
Course, it is again ramified, and sen
forth in this place Branches, which a
spread over the fore-part and back-part
the Ear.

T

to face page. 5

Fig. I.

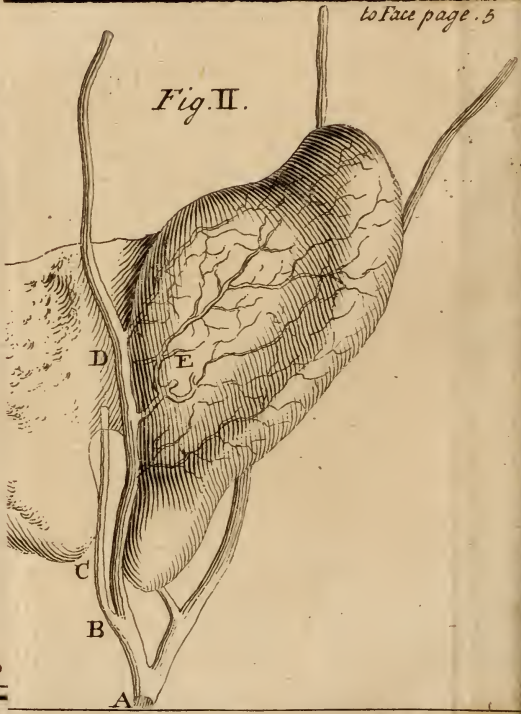


B Cole Sculp.

Fig. II.

to Face page. 5

Fig. II.



B

The Veins are Ramifications of the External Jugular, which follow the Diſtribution of the Arteries. *See* Plate II. Fig. I, II. *Of Veins.*

Explanation of Plate II.

Fig. I. *repreſents the Arteries, which are diſtributed upon the fore-part of the Ear.* A, *the external Carotid, cut off above the Angle of the Jaw.* B, *the Branch which paſſes behind the Ear.* C, *the Branch which paſſes to the fore-part.* D, *the Ramification of this Branch, which is diſtributed to the Lobe of the Ear.* E, *a Branch of an Artery, which paſſes through the Cartilage from the back-part to the fore-part, and is diſtributed to the Inſide of the* Concha.

Fig. II. *repreſents the back-part of the Ear, to ſhew the Arteries which are behind the Ear.* A, *the ſame Trunk of the Carotid.* B D, *the Branch which paſſes behind the Ear, and which as it paſſes furniſhes it with many Ramifications.* C, *a Branch which is diſtributed to the* Caverulæ *of the* Proceſſus Mammillaris. E, *the Branch which paſſes through the Cartilage, to be diſtributed to the Inſide of the* Concha.

Of Nerves. As for the Nerves, we shall treat of them when we come to describe all those which belong to the Organ of Hearing.

The Hole of the Ear is divided into two Parts. That which is called the Hole of the Ear, is a Passage, of which the *Concha* is as the *Vestibulum* or Entry, and which leads to a Membrane, called the Drum.

1. *The Cartilaginous Part.* This Passage is partly Cartilaginous, and partly Bony. The Cartilaginous Part is formed by the Contraction of the *Concha*; this Part is about four or five Lines in length; the Cartilage which forms it is continued in itself, but it is broke off and separated in many Places, as by so many Cuts which are not join'd together again, but by the Skin which covers the Inside of the Passage. This Cartilaginous Part covers but half the Auditory Passage, almost all the upper Part being only enclos'd by the Skin, which lines its Inside. See *Plate* III. *Fig.* I. and II.

Which is broke off in many Places.

Explanation of Plate III.

Fig. I. *represents the Cartilage of the Ear, and the cartilaginous Passage divested of all their Integuments.* A, *the Cartilage of the Ear, with its Folds.* B, *the cartilaginous Passage growing something fla-*

C

Fig. I.

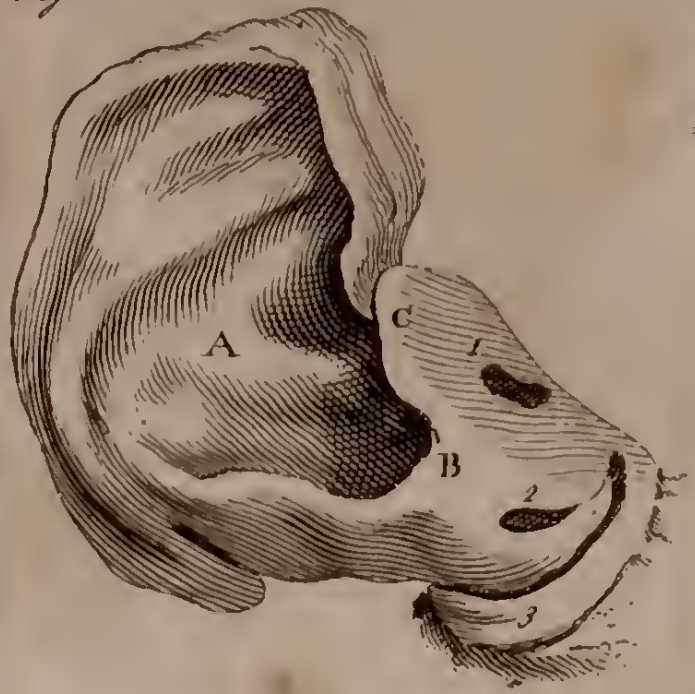


Fig. III.

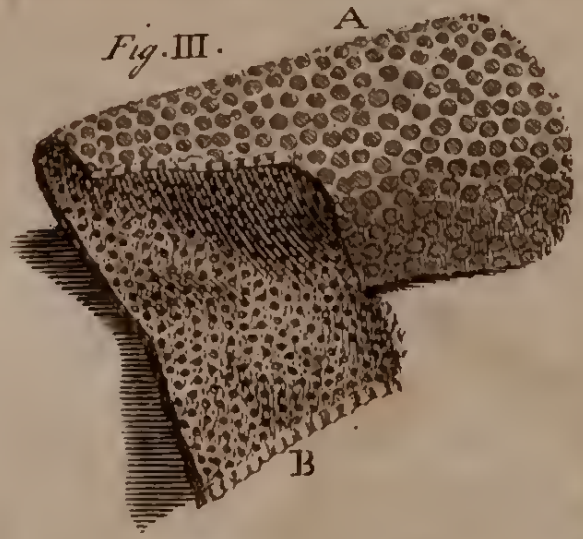


Fig. IV.

Fig II

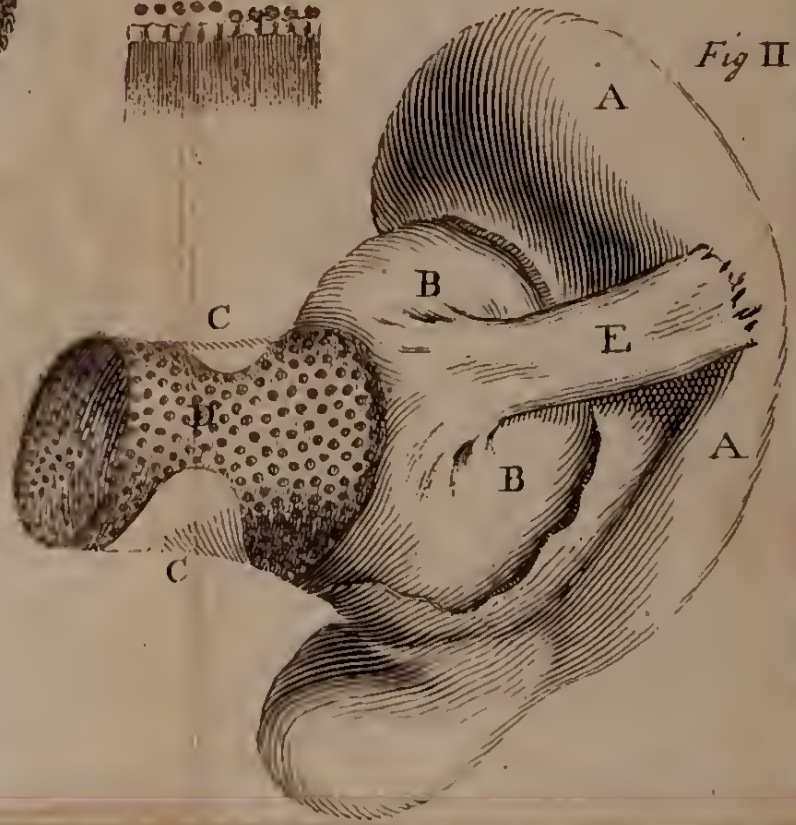
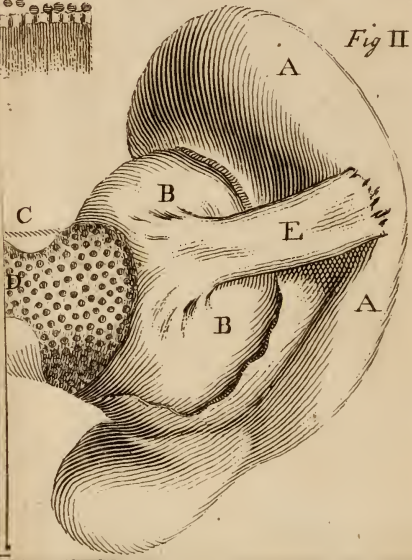


Plate. III.

ig. IV.

Fig II



C, *the Part of the Cartilage which forms the Entrance of the Paſſage, and which makes a little Tongue at the forepart of the* Concha. 1, 2, 3, *The three Interruptions of the cartilaginous Paſſage.*

Fig. II. *repreſents the back Part of the Ear, and the upper Part of the cartilaginous Paſſage, with the Ligament, which ties the* Concha *to the temporal Bone.* A, A, *the back part of the Ear,* B, B, *the back part of the* Concha, *diveſted of the Skin.* C, C, *the Appendixes which terminate the Cartilage in the upper Part.* D, *the ſuperior Part of the Paſſage, which is form'd of nothing but of a glandular Membrane.* E, *the Ligament of the Ear revers'd.*

Fig. III. *repreſents the glandular Membrane, which inveſts the cartilaginous Paſſage; it appears in this place three times larger than Nature, for the better diſtinguiſhing all the Parts.* A, *the exterior Part of the glandular Membrane.* B, *the Paſſage open'd, in which the ſmall Hairs and the Orifices of the excretory Ducts of the Glands are viſible.*

Fig. IV. *repreſents the Diameter of the Part of the Paſſage, to ſhew how the Glands are half buried in the Thickneſs of the Membrane: Some of them are drawn out, to ſhew more plainly how deep they are buried.*

And cover'd with a Skin. This Skin, which is a Continuation o that which is in the fore-part of th *Concha*, is ſtrew'd with an infinite Num *Adorn'd with many little Glands.* ber of ſmall Glands of a yellowiſh Co lour, and a little inclining to an ova Figure, which lie under this Skin, an are ſomewhat depreſs'd in its Thickneſs Each Gland has a ſmall Duct, which open into the Cavity of the Paſſage among th little Hairs with which it is ſtor'd: And theſe are the ſmall Ducts which emit tha thick glutinous and yellow Matter, whic is commonly found in the auditory Paſ ſage. This cartilaginous Paſſage ends by adhering to many Inequalities, which ar at the entrance of the bony Canal; whic is only a Continuation of that which is Car tilaginous. Theſe Inequalities are pretty conſiderable on that ſide of the Entranc next the Face, to which the Cartilag ſtrictly adheres. And as there are bu few of theſe Inequalities at the oppoſit Side, next to the back part of the Head *And is connected to the* Os Temporum *by a Ligament.* the Cartilage is connected in this place t the Bone by a ſtrong Ligament; whic coming from the Extremities of the *Con cha*, paſſes along the membranous Pa of the cartilaginous Paſſage, and is in ſerted into a ſmall Cavity in the C

Temporal

to Face page 9

Plate. IV.

Fig I.

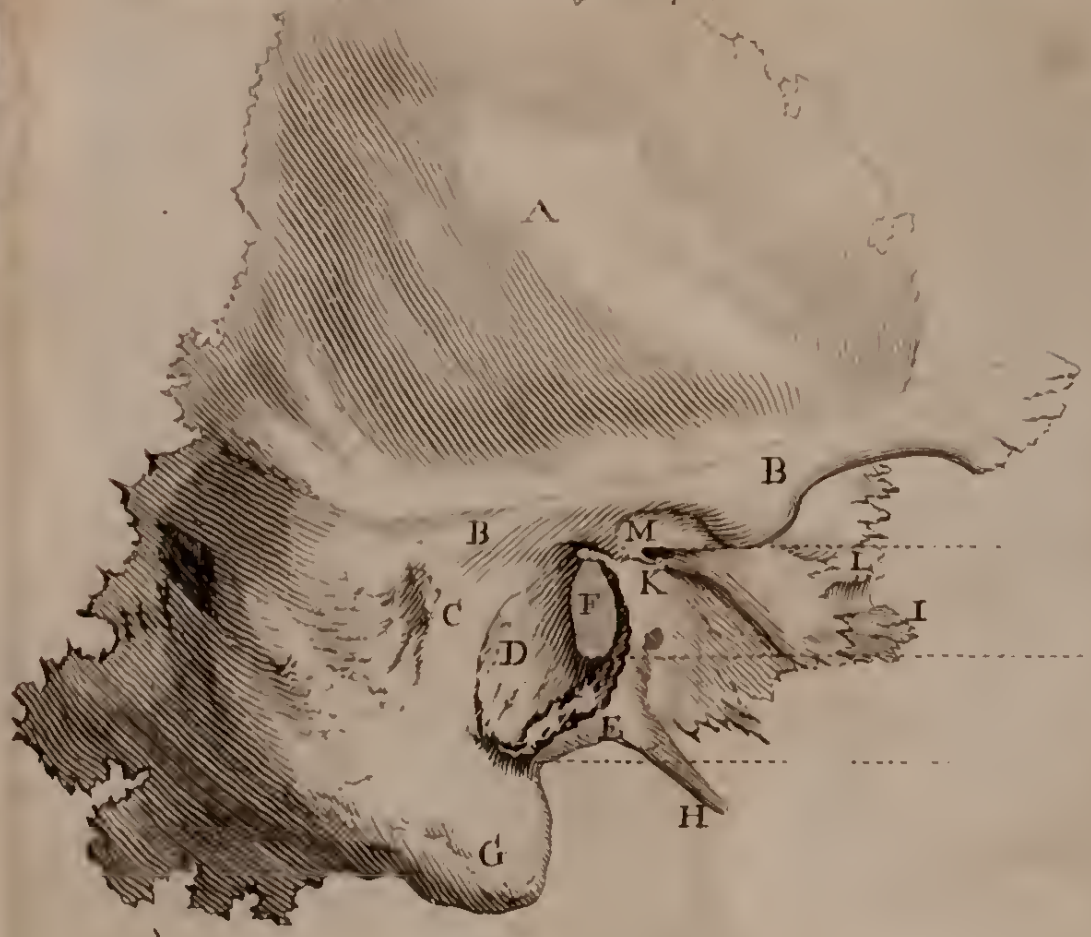


Fig. II.

B. Cole. Sculp.

Plate. IV.

Fig. II.

Temporale, at the Entrance of this bony Canal. See *Plate* III. *Fig.* II, III, IV. and *Plate* IV. *Fig.* I.

Explanation of Plate IV.

Fig. I. *repreſents the* Os Temporale *bare.* A, *the ſcaly Part of this Bone.* BB, *the* Proceſſus Zygomaticus. C, *the little Cavity, into which the Ligament of the Ear is inſerted.* D, *the Entrance of the bony Paſſage of the Ear.* E, *the Inequalities which are on that Side of this Entrance next the Face.* F, *the* Membrana Tympani, *in its Scituation.* G, *the* Proceſſus Mammillaris. H, *the* Proceſſus Styloides. I, *the Tube, which incloſes the internal Carotid.* K, *a ſmall* Sinus, *which is between the bony Paſſage and the ſcaly Part of the* Os Temporale, *through which the external Muſcle of the* Malleus *penetrates into the* Tympanum. L, *the Extremity of the bony Paſſage, which forms part of the Paſſage which goes from the Ear to the Palate.* M, *the Cavity, into which the Condyloide Proceſs of the lower Jaw is inſerted.*

Fig. II. *repreſents the bony Paſſage, taken off from the temporal Bone.*

2dly. The bony Part.

This bony Part of the Auditory Paſſage, appears as if it was join'd to the *Os Temporale*. This Paſſage is, as it was ſaid before, the Continuation, or rather the Foundation of the cartilaginous Paſſage: Its Bore is a little Oval at the Beginning, but the more it advances towards the Extremity, it grows flat.

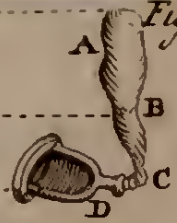
The cartilaginous and bony Parts form the auditory Paſſage.

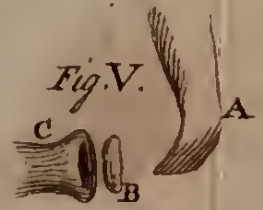
That which is called the Auditory Paſſage, is form'd of a cartilaginous and bony Canal, placed one at the End of the other; this Canal runs obliquely and grows curv'd. For its Courſe, which at firſt aſcends and proceeds from the hind part to the fore-part, as far as its Middle, turns aſide afterwards, and deſcends again, always proceeding forwards as far as the *Membrana Tympani*. *See* Plate IV. Fig. I, II.

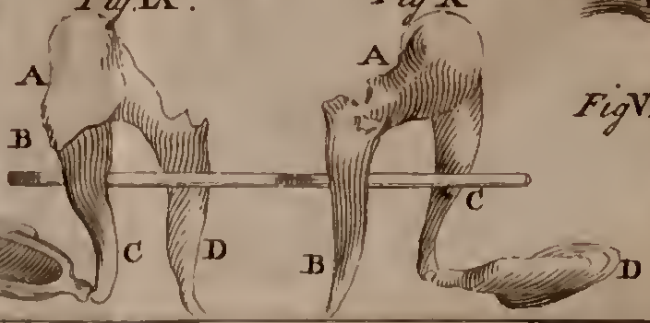
The external Part of the Organ of Hearing, is ſeparated from the internal, by the Membrana Tympani.

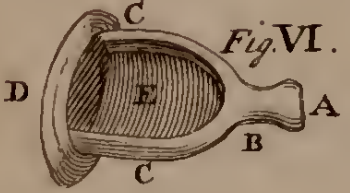
At the End of this Paſſage we find the *Membrana Tympani*, which ſeparates the above deſcrib'd external Ear from the Internal, and exactly cloſes up the Extremity of the Paſſage, as before taken notice of. This Partition is compos'd of a thin, dry, firm, tranſparent Membrane, almoſt round, and connected into a hollow Groove in the Circumference, at the end of the bony Paſſage. This Groove lies nearer the Inſide of the Head at its Bottom

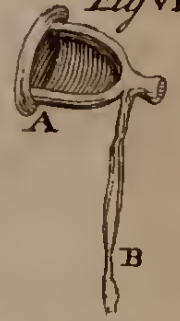
Plate V



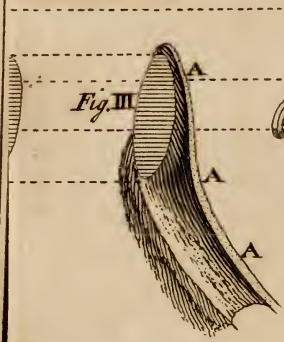








B. Cole Sculp.



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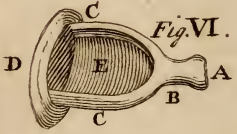

tom than at its Top; it does not make a compleat Circle, but ends at the upper parts of its Circumference. Although this Membrane be extended, yet it does not make a plain Superficies; but it is indented inwards, by being fixed to the Handle of the Malleus. *See* Plate V. Fig. I, II, III. and Plate VII. Fig. I, II.

Explanation of Plate V.

Fig. I. *represents the temporal Bone twice as large as Nature, in which all the scaly Part is cut off, and but as much of the bony Passage taken away, as was necessary to shew the* Membrana Tympani *bare.* A, *the* Membrana Tympani *in its Situation, and seen in the Front.* B, *the Handle of the* Malleus, *which is join'd to the back part of this Membrane.* C, *the long Branch of the* Incus, *which appears cross this Membrane, though it is a little way remov'd from it.* D, *the Head of the* Malleus. E, *the massy Part of the* Incus, *with its short Branch.* F, *which in this Section appears plainly.* G, *the bony Passage, half of which is cut off.* H, *the* Processus Mammillaris. I, *the* Styloides. K, *the external Muscle of the* Malleus *in its Situation.* L, *a punctur'd Line, which shews*

the thin Proceſs of the Malleus, *into which this Muſcle is inſerted.*

Fig. II. *repreſents the* Membrana Tympani *ſeen ſideways, to ſhew the better how it inclines.*

Fig. III. *repreſents the* Membrana Tympani *in the ſame View, and fix'd in the Extremity of the bony Paſſage; it alſo ſhews in what manner the Side of this Paſſage next the Face recedes, at the lower part from the* Membrana Tympani, *and how it approaches inſenſibly nearer to it as it aſcends.* AAA, *the Side of the bony Paſſage next the Face.*

Fig. IV. *repreſents the* Incus, *and the* Stapes *in their Scituation ſideways.* A, *the maſſy Part of the* Incus. B, *the ſhort Branch of the* Incus, *which in this Scituation appears exactly in the Front.* C, *its long Branch.* D, *the Head of the* Stapes, *which is joined with the long Branch of the* Incus, *by the Intervention of a fourth little Bone.*

Fig. V. *repreſents the Beak of the long Branch of the* Incus, *the fourth little Bone and the Head of the* Stapes *with its Cavity; all of them being four times larger than Nature.* A, *the Beak of the long Branch of the* Incus. B, *the fourth little Bone.* C, *the Head of the* Stapes *with its Cavity.*

Fig.

Fig. VI. *repreſents the* Stapes *five times larger than Nature.* A, *the Head of the* Stapes. B, *its* Collum *or Neck.* C C, *its Branches, which are hollow like a Gutter.* D, *its Baſis.* E, *the Membrane of the* Stapes.

Fig. VII. *repreſents the Baſis of the* Stapes *ſeen in the ſame Senſe, to ſhew that it is hollow like a Gutter.* D, *the Baſis of the* Stapes.

Fig. VIII. *repreſents the* Stapes *with its Muſcle in its natural Scituation.* A, *the* Stapes. B, *its Muſcle, the whole being repreſented twice as large as Nature.*

Fig. IX. *repreſents the* Officulæ *ſeen in the Scituation they would be in, if the Eye was placed in that Paſſage which penetrates into the* Proceſſus Mammillaris. A, *the maſſy Part of the* Incus. B, *its ſhort Branch ſeen in the Front.* C, *its long Branch.* D, *the back part of the Handle of the* Malleus. E, *the upper part of the* Stapes.

Fig. X. *repreſents the* Officulæ *in their Scituation, view'd from the oppoſite Side, the Eye being placed in the Paſſage which paſſes from the Ear to the Palate.* A, *the Head of the* Malleus, *which covers the maſſy Part of the* Incus, *and its ſhort Branch.* B, *the Handle of the* Malleus. C, *the long*

long Branch of the Incus. D, *the* Stapes *ſeen ſideways: The Stick which croſſes the* Officulæ *is placed here, to diſtinguiſh which are placed before and which behind, in theſe different Views.*

Explanation of Plate VII.

Fig I. *repreſents the back part of the temporal Bone, with as much of it cut off as was neceſſary to ſhow the* Membrana Tympani, *upon which the back part of the* Malleus *and* Incus *is ſhewn, with the ſmall Branch of a Nerve, called the* Chorda Tympani, *and the Tendon of the external Muſcle of the* Malleus, *beſides the Cavity, upon which the Head of the* Malleus *and the maſſy Part of the* Incus *reſts, all in their natural Scituation.* A, *the back part of the ſcaly part of the temporal Bone.* B, *The* Proceſſus Mammillaris, *in the ſame View.* C C, *the* Os Petroſum *cut off.* D, *the* Membrana Tympani. E, *the* Malleus. F, *the* Incus *with its ſhort Branch, reſting upon the Entrance of the Paſſage, which penetrates into the* Cavernulæ *of the* Proceſſus Mammillaris. G, *the* Foramen *of the auditory Nerve.* 1. *The Tendon of the external Muſcle of the* Malleus. 2, 3. *The* Chorda Tympani.

Fig.

Fig. I.

Fig. II.

B. Cole. Sculp.

Fig. II. *likewise represents the back part of the* Os Temporale *twice as large as Nature, all the scaly Part of which is taken away, and is saw'd from the Top to the Bottom, according to the Plan of the Groove, in such a manner, that it is divided through the Middle of the* Processus Mammillaris: *By this is shewn the Groove which receives the* Membrana Tympani *into it, and the Place where this Groove is wanting; it also shews how the Side of the bony Passage, next the Face grows flat near its Bottom, and covers a Part of the* Membrana Tympani; *and lastly, it discovers all the* Cavernulæ *of the* Processus Mammillaris. AA, *the Groove.* a, *the Place where it is wanting.* B, *the Side of the bony Passage next the Face, which grows flat in this Place.* C, *the* Malleus. D, *the* Chorda Tympani *which is drawn inwards, to show how it passes over the external Muscle.* 2, 3. *The small Sinus which is excavated out of the Bone above the Groove, and which serves as a Pulley to the Muscle.* E, *the external Muscle, which is also drawn inwards.* F F, *the bony Part of the Passage, which goes to the Palate.* G, *the Passage which leads into the* Processus Mammillaris. H, H, *the* Cavernulæ *of the same Process.*

Behind

The first Cavity in the internal Ear, called the Tympanum, *or Drum.*

Behind this Membrane is a Cavity called the *Tympanum*, from a sort of Resemblance it bears to the Box of a Drum, being on every Side surrounded with Bone, enclos'd before by the above-mention'd Membrane, and behind by the Surface of the *Os Petrosum*. This *Tympanum* is two or three Lines deep, and six broad; there are two Passages in its Sides, one of which is scituated in the fore-part, and is called the Aqueduct, and opens into the Palate. The other is scituated on the opposite Part, and in the Top of the Cavity opens into the *Cavernulæ* or Sinuositys of the *Processus Mammillaris*: At the Top of this *Tympanum* there is a small Cavity, in which the Heads of the *Officula*, (which we shall describe in the sequel) are placed. The Cavity of the *Tympanum* is rugged, unequal, and furnish'd with a Membrane, which is strew'd with a great Number of Vessels, some of which are Ramifications of the carotid Artery, which are distributed to the *Dura Mater*: The *Foramina* through which they pass are placed in the superior Part of the *Tympanum*, and very nigh the *Foramen*, through which this Artery belonging to the *Dura Mater* enters the *Cranium*.

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Plate IX.

Fig. I.

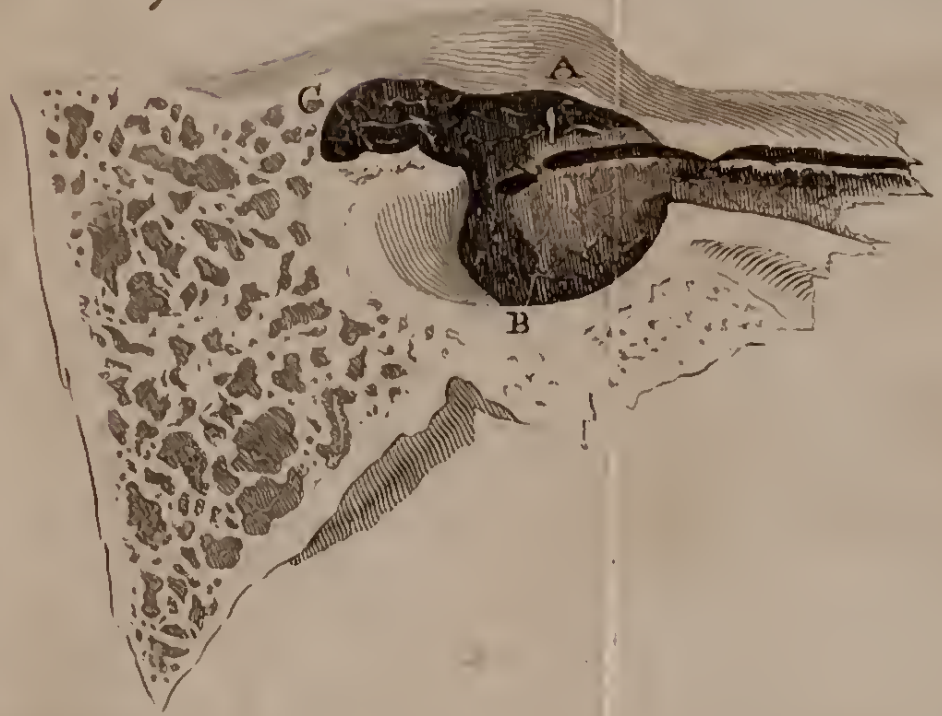
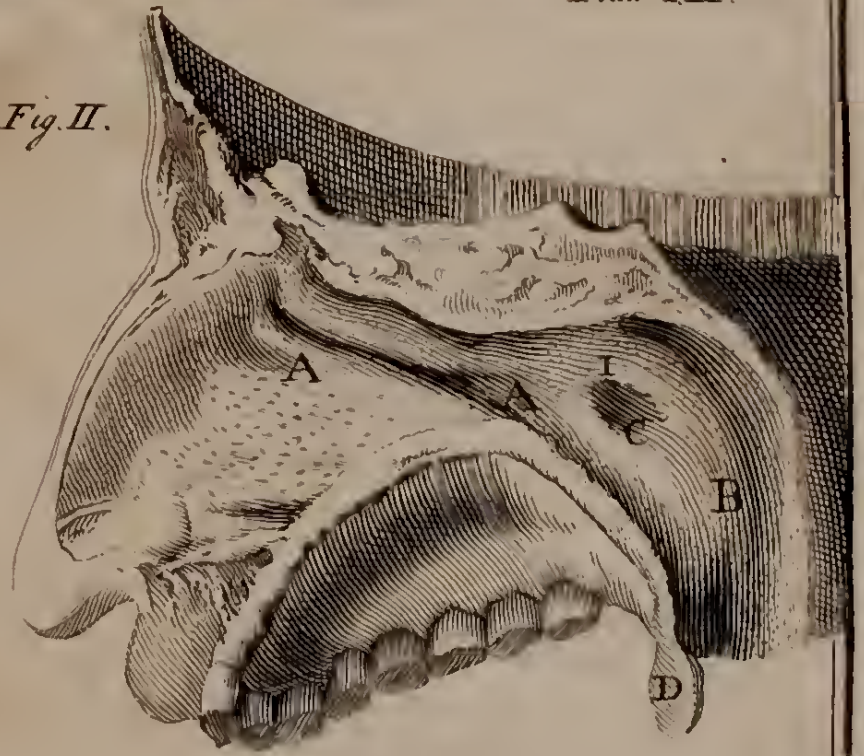


Fig. II.



B. Cole Sculp.

to Face page 17

Fig. I.

B. Cole Sculp.

ium. The others are Ramifications of those that furnish the Membranes, which over the *Cavernulæ* of the *Processus Mammillaris.* *See* Plate IX. Fig. I.

Explanation of Plate IX.

Fig. I. *represents the temporal Bone twice as large as Nature, all the scaly Part being taken off, and being saw'd perpendicular down a little distance before the Groove, to shew the Depth of the* Tympanum *and the* Cavernulæ *of the* Processus Mammillaris, *to discover their Vessels, and those which are spread upon the Membrane, which covers the* Tympanum. A, *a considerable Artery, which is a Ramification from that of the* Dura Mater. B, *a Vein which is sent off at the Entrance of the internal Jugular, which is at the bottom of the* Tympanum. C, *the Vessels which are sent off from the* Cavernulæ *of the* Processus Mammillaris, *to be distributed to the* Tympanum.

Fig. II. *represents half a Head one third less than Nature, all the upper Part of the* Cranium *of which is taken off, and the rest cut perpendicular through the Middle of the Nose, to shew the Orifice of the Passage which goes from the Ear to the Palate.* A, *the Cavity of the Nose, with its*

Laminæ.

Laminæ. B, *the* Fundus *of the Palate*. C, *the Orifice of the Paſſage which leads from the Ear to the Palate.* 1. *Its cartilaginous Side, which forms a Border in the ſhape of a Creſcent.* D, *the* Uvula *cut through the middle.*

Has five remarkable Things in it.

There are five remarkable Things to be taken notice of in the whole *Tympanum*, *viz.* Two Paſſages, two *Feneſtræ*, four ſmall Bones, three Muſcles, and a Branch of a Nerve.

1. Two Paſſages, one of which paſſes into the Palate.

The Paſſage which paſſes from the Ear into the Palate, is called Aqueduct, not only becauſe it is like a Canal, but alſo becauſe it can make room for the Filth and other extraneous Humours, which are often gathered in the Inſide of the *Tympanum*, not being provided with any ſmal Valve to hinder their Egreſs. This Paſſage is bony as it comes from the *Tympanum*, and its Inſide is lin'd with th ſame Membrane which covers the *Tympanum*. It is ſcituated in the fore-part the bony Canal, which encloſes the intern carotid Artery, and afterwards proceeding about three Lines in length, it terminates by many Unevenneſſes, whic form Gaps, to which another Tube part ly membranous and partly cartilaginou

s fix'd, which compoſes the reſt of the Paſſage. The membranous Side of this Paſſage faces the Hole of the Ear, and he cartilaginous Part the back-part of the Head. This Tube runs obliquely back-vards as far as the Root of the Noſe, at he Extremity of the Palate, a little above he *Uvula*, and proceeding about the ength of an Inch, it ends near the Mid-lle of the interior Part of the internal ide of the Proceſſes, which are called *Pterigoidei*. This Paſſage is much larger han that which is bony; it is cover'd on he Outſide by one of the Muſcles, which erve to dilate the *Pharynx*, and on the In-ide by a glandulous Skin, which is a Con-inuation of that which lines the Inſide of he Noſe. The cartilaginous Part of this Paſſage grows thick towards its End, and orms a Border in the ſhape of a Creſcent. The Inſertion of the Aqueduct is ſo diſ-pos'd, that the Air which is receiv'd into he Mouth through the Noſtrils, is neceſ-arily drawn into it. For the Horns of he Creſcent, particularly the lower one, xtend in ſuch a manner into the Inſide of the Noſtrils, that it is impoſſible but hat the Air muſt ſtrike againſt theſe Horns as it paſſes along; and that a great Part of this Air being ſtop'd, and as it

were

were intercepted in the Paſſage, muſt enter into the Aqueduct; otherwiſe all the Air would paſs through the great Apertions of the Noſtrils, directly into the Cavity of the Thorax. Mr. *Louver* has obſerv'd a like Piece of Mechaniſm in the Inſertion, or Opening of the axillary and carotid Arteries into the *Aorta*. For this Veſſel which paſſes out of the left Ventricle of the Heart, growing curv'd as it deſcends, would carry almoſt all the Blood which is ſent out of the Heart into its deſcending Trunk, if the axillary and carotid Arteries, which ariſe from the Middle of the Curve of the *Aorta*, were not diſpos'd, in ſuch a manner, that that Side of every Orifice which is the fartheſt from the Heart, being more elongated than the other, they ſtop a great part of the Blood as it paſſes before their Orifices. *See* Plate VIII. Fig. I, II. and Plate IX. Fig. II.

Explanation of Plate VIII.

Fig. I. *repreſents the temporal Bone twice as large as Nature, the ſcaly Part being taken off, and part of the bony Paſſage taken away, and in general all the Parts of the* Tympanum, *which might hinder the View of the Surface of the* Os Petroſum, *which*

Fig. I.

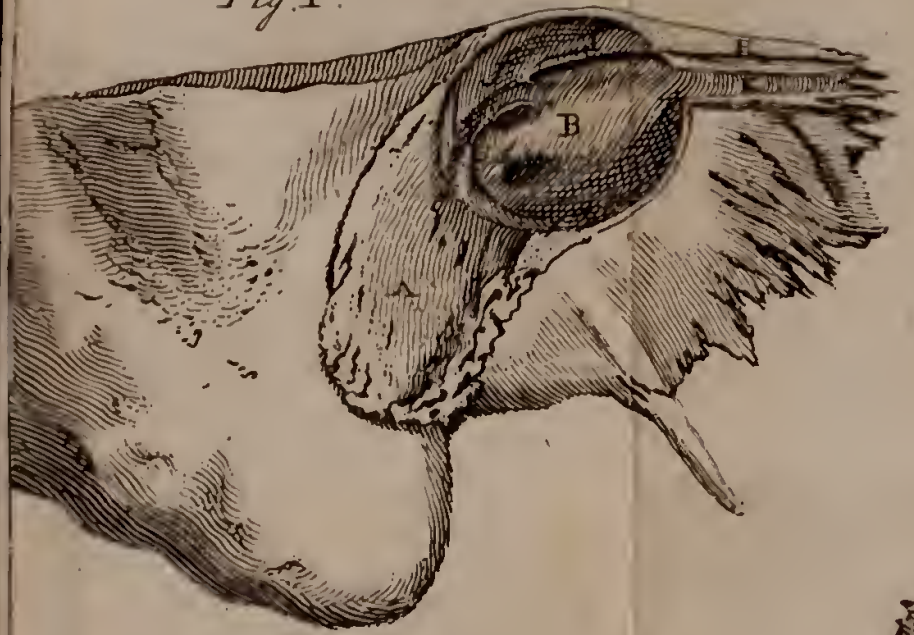
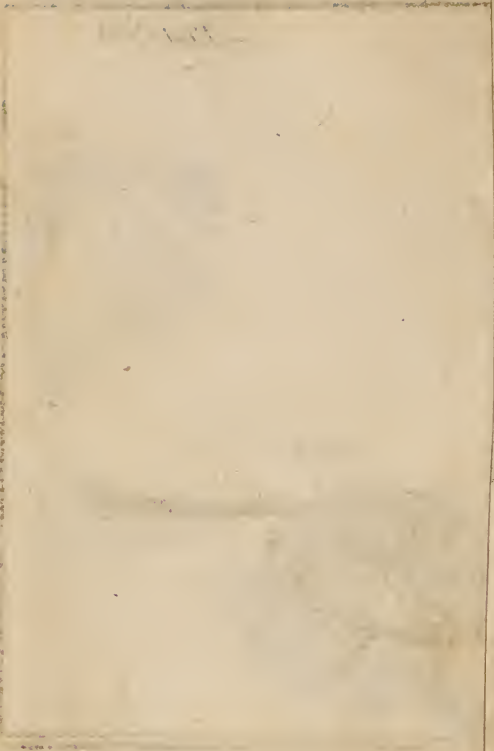


Fig. II.



which makes one of the Parietes *of the* Tympanum. A, *Part of the bony Paſſage.* B, *the Protuberance which is in the Surface of the* Os Petroſum, *and which covers the* Lamina Spiralis. C, *the* Feneſtra Ovalis. D, *the* Feneſtra Rotunda. E, *the bony Canal which encloſes the Muſcle of the* Stapes, *from which the Tendon is ſhown extruded, to be inſerted into the Head of the* Stapes. F, *the Canal which encloſes the* Portio Dura *of the auditory Nerve.* G, *a punctur'd Line to ſhew the Circumference which the* Membrana Tympani *takes up, and how large the* Tympanum *is.* H I, *the Semi-Canal, which encloſes the internal Muſcle of the* Malleus. H, *that Part of this Semi-Canal, which is extruded from the* Tympanum. I, *the Part which is in the* Tympanum. K. *half of the bony Paſſage, which leads from the Ear to the Palate.*

Fig. II. *repreſents the temporal Bone, pretty nigh in the ſame View as the preceeding Figure, but only as large as Nature, to ſhew the* Stapes *in its Situation, and the Canal which leads from the Ear to the Palate in its natural Direction.* A, *the* Stapes *in its Scituation.* B C, *the bony Part of the Canal.* D, *its cartilaginous Part, which grows thicker and larger at its Extremity.* E, *its membranous Part turn'd back.*

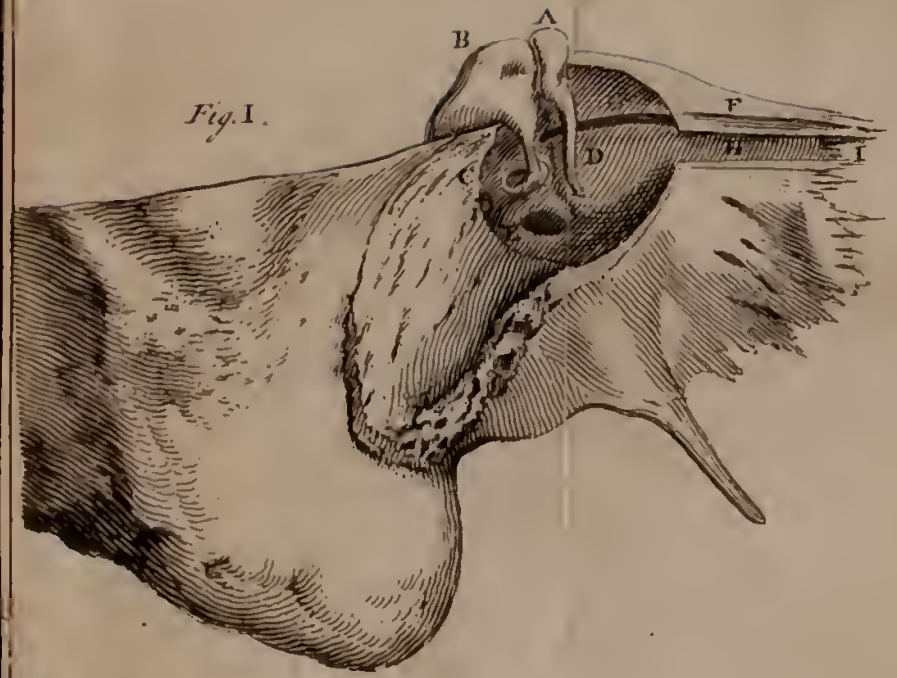
The

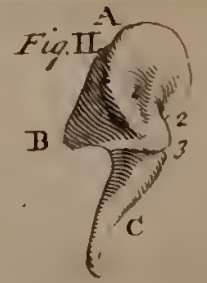
The other into the Cavernulæ of the Proceſſus Mammillaris. The other Paſſage, which is ſcituated on the Top of the *Tympanum* is broader, but much ſhorter than the Aqueduct, and penetrates, as before mentioned, into the *Cavernulæ* of the *Pro ceſſus Mammiformis*. *See* Plate VII. Fig. II. Plate IX. Fig. I.

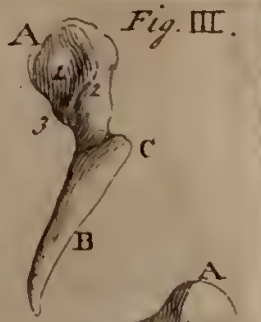
2dly, *Two Apertures, or* Feneſtræ. The two Apertures, or *Feneſtræ* of the Tympanum, are placed in the Surface of the *Os Petroſum*, which lies directly oppoſite to the *Membrana Tympani*. The *Os Petroſum* being about the thickneſs of a Line where they pierce, is the Reaſon why each of theſe *Feneſtra* forms a ſort of a ſmall Paſſage, the Thickneſs of a Line. The firſt *Feneſtra* is called Oval from its Figure, and is ſcituated a little higher than the other. At the end of its Paſſage it has a ſmall Border in the form of Foliage, upon which the Baſis of one of the ſmall Bones, term'd *Stapes*, is placed. The other *Feneſtra*, which is call'd *Rotunda* or Round, though it is like the other of an Oval Figure, has a Groove in the middle of its Paſſage, for the Inſertion of a dry, thin, and almoſt tranſparent Membrane, very like that of the *Tympanum*. *See* Plate VI. Fig. I. Plate VIII. Fig. I, II. and Pate IX. Fig. I.

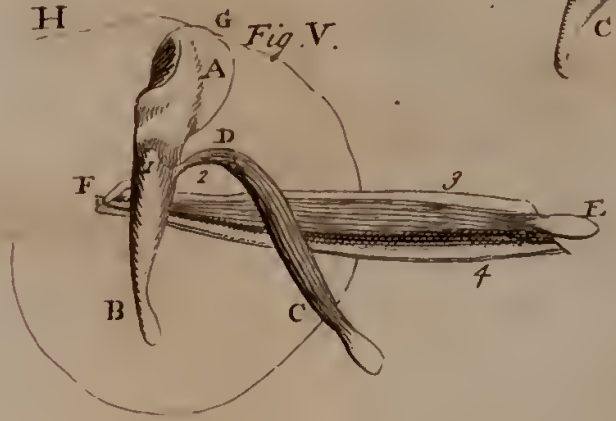
Expla-

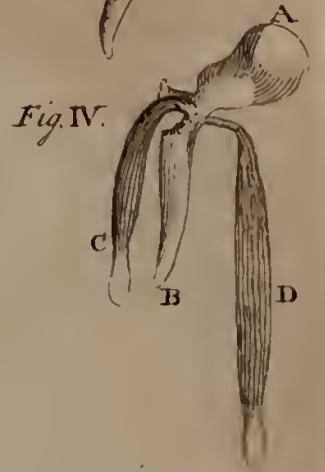
Plate VI











B Cole Sculp

Plate VI

Fig. III.

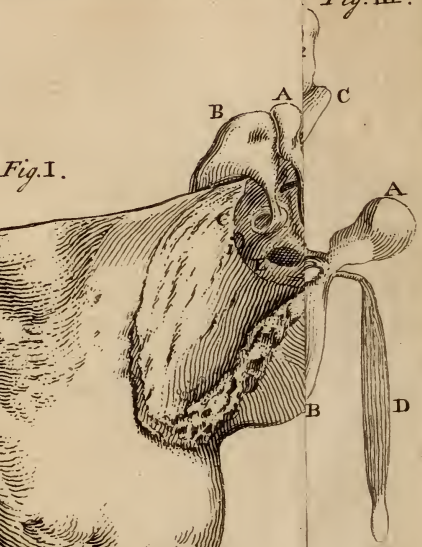


Fig. I.

B Cole Sculp

Explanation of Plate VI.

Fig. I. *repreſents the ſame Bone, cut i the ſame manner as* Fig. I. *of* Plate V. *e whole being alſo twice as large as Na- re, only the* Membrana Tympani *is taken , to ſhew the* Officulæ *in their Scituation, d the Inſide of the* Tympanum *with its tain'd Parts.* A, *the* Malleus. B, *the* cus. C, *the* Stapes *ſeen in the Front, Head being cover'd by the Beak of the g Branch of the* Incus; *its Baſis ſtopping the* Feneſtra Ovalis. D, *the* Fundus *of* Tympanum, *which is the Surface of the* Petroſum. E, *The* Feneſtra Ovalis. G, *the Semi-Canal, which incloſes the in- rnal Muſcle of the* Malleus. F, *that Part the Semi-Canal which is ſituated out of the* ympanum. G, *the part which is in the In- le of the* Tympanum. H I, *the bony Part the Paſſage, which goes from the Ear the Palate, half of it being cut off to ew its Cavity.* i, *the End of the Tube, hich encloſes the Muſcle of the* Stapes.

Fig. II. *repreſents the* Incus, *on that de where it is articulated with the* Malleus. , *the maſſy Part of the* Incus. B, *the ort Branch, placed almoſt in the Front.* C, *e long Branch.* 1, *The firſt Cavity.* 2, *the econd.* 3, *The Eminence betwixt the other o Cavities, mark'd by a punctur'd Line.*

Fig.

Fig. III. *repreſents the* Malleus *on th Side where it is articulated, to ſhew i Eminences and Cavity, which ſerve for i Articulation.* A, *its Head.* B, *its Ha dle.* C, *the large Proceſs.* 1. *The fir Eminence*; 2. *The ſecond Eminence*; 3. *Th Cavity which is between them, mark'd by punctur'd Line.*

Fig. IV. *repreſents the* Malleus *with i two Muſcles, the Eye being plac'd in th Aqueduct, to ſhew the Compaſs of the tw Muſcles, particularly that of the Interne which croſſes the* Tympanum *in its Pro greſs to be join'd to the* Malleus. A, B, *th* Malleus. C, *the external Muſcle.* D *the internal Muſcle.*

Fig. V. *repreſents the Circumference o the* Tympanum, *and the fore-part of th* Malleus, *with its Muſcles in their Scituation* A, *the Head of the* Malleus. B, *th Handle.* C, *the external Muſcle of th* Malleus. D, *its Inſertion.* E, *the inter nal Muſcle.* F, *the Place where it bends to be inſerted in the Handle of the* Malleus *below the external Muſcle.* G H, *the Cir cumference of the* Tympanum; 1. *The larg Proceſs of the* Malleus *ſeen in Front*; 2 *The thin Proceſs, into which the externa Muſcle is inſerted*; 3, 4. *The nervous Coa of the internal Muſcle, open'd to ſhow th Muſcle.*

This

This Figure serves to explain the Manr in which the two Muscles of the Malus *act, in the Contraction and Relaxation the* Membrana Tympani: *For their Intions make it easily be conceiv'd, that when e external Muscle* C D, *acts alone, the Exemity of the Handle mark'd* B *is drawn twards, because the Head of the* Malleus *ts against the* Tympanum *at the Place* G; *t when the two Muscles act together, the xtremity of the* Malleus *being drawn inards by the internal Muscle* E F, *causes Tension in the* Membrana Tympani; *ause the external Muscle* C D, *draws, at least supports the Head of the* Malleus, *ich does not rest against the* Tympanum H, *as it does at* G.

3dly, Four little Bones.

The first among the little Bones contain- *The* Malleus.
in the *Tympanum*, which presents itself View, is called the *Malleus*, because it is cker at one of its Extremities, call'd the ad, and slenderer at the other, which is led the Handle. The Head of this Bone fix'd in the above-describ'd Cavity, ich is in the Top of the *Tympanum*: At Side and a little towards the back-part he Head of this Bone are two Protubeces, and a Cavity for its Articulation h the *Incus*. The other Part of the

Bone, which is thinner, ſlenderer, a more elongated, call'd the Handle, encreas'd in Bulk by two *Proceſſes*, t largeſt of which is outermoſt, and is fix to the *Membrana Tympani:* The othe which is on one Side, is ſlenderer a ſmaller, and receives the Tendon of Muſcle. This Handle leans upon, a is fix'd a little obliquely to the *Membra Tympani*, and growing flat at its Extr mity, is more firmly connected to it in t Place: This little Bone is common about the Length of four Lines, and t Diameter of its Head is the Third of whole Length.

The Incus. The ſecond little Bone is called *Incu* or *Anvil*, becauſe of its Figure. The are three Parts to be taken notice of this Bone, *viz.* Its maſſy Part, whi makes up the Body of the Bone, and two Branches which are *Proceſſes*, a ſeem like Legs to it: The maſſy P has two Cavities and one Protuberan to anſwer the two Protuberances, and c Cavity of the Head of the *Malleus*, be join'd to it by that ſort of Articulati which is call'd *Ginglymus*, and which M chanicks term Hinges. Almoſt all t maſſy Part lies conceal'd in the aforeſ Cavity, in the Top of the *Tympana*

T

he ſhorteſt of theſe Branches is placed
the Entrance of the Paſſage, which
es into the *Proceſſus Mammillaris*, and
Extremity is conceal'd and fix'd by a
gament in a ſmall Cavity, which is at
e Entrance of this Paſſage. The other
anch, which is the longeſt, deſcends per-
ndicular into the *Tympanum*, and grow-
g curved within, on that Side oppoſite
e *Membrana Tympani*, it forms a little
ak which is articulated, by the Help
a fourth Bone, to the ~~Incus~~ which is
third Bone. *Stapes.*

The *Stapes*, or Stirrop, is ſo call'd from *The* Stapes.
exact Reſemblance to a Stirrop, having
o Branches plac'd upon a flat and
l Baſis, pretty like that part of the
rop upon which we lean our Foot;
at the Top it has a ſmall Head,
ch is like that Part through which
Stirrop is tied. It is in this Part
there is found a little Cavity, to re-
e the fourth little Bone. The *Stapes*
uated in ſuch a manner, that its Head
g ſeen in the Front, almoſt hides its
s; all the interior Part of the Branches
Baſis of the *Stapes*, is form'd hol-
like a Gutter. This ſmall Bone is
'd almoſt horizontal in this Cavity;
two Branches and its Baſis make a

kind of a Frame, to the Bottom of which is fix'd and join'd a Membrane, in the same manner as oil'd Paper is fix'd to a Window-Frame. This Membrane is of a fine Texture, and ſtrewed with a great Number of Veſſels. The Baſis of the *Stapes* is ſunk into the *Feneſtra Ovalis*, which it exactly cloſes up: It is fix'd to that Border which is made in the Form of Foliage, and which has been deſcrib'd before, by the Help of a Membrane which connects it to it ſo exactly, that it can't poſſibly by any Means be ſunk down into the Cavity, which is at the Bottom, nor lifted up to the Top of the *Feneſtra*, without breaking the Membrane.

The fourth little Bone.

The fourth little Bone is of a very inconſiderable Thickneſs, it is a little convex on the Side next to the Head of the *Stapes*, and as much, though but a little concave on the Side, which is articulated with the Beak of the *Incus*.

Theſe ſmall Bones are cover'd with *Perioſteum*, and there is no Cartilage found at the Places of their Articulation; but they are firmly connected together only by Ligaments, which ariſe from their Extremities.

The *Malleus* and *Incus* are of a very compact and ſolid Subſtance; they only

a

e pierced by ſome *Foraminula*, which ford an Entrance for the Veſſels which uriſh them. The *Stapes* on the contra- is of a very light and porous Sub- nce. *See* Plate V. Fig. I, IV, V. VI. I, IX, *and* X. Plate VI. Fig. I, III, d IV; *and* Plate VII. Fig. I, *and* II.

Two of the three Muſcles which are the *Tympanum* belong to the *Malleus*, third belongs to the *Stapes*: The ſt of thoſe which belong to the *lleus*, may be called External, be- ſe it is ſituated upon the exterior Side the bony Canal, which paſſes from the r to the Palate, and continuing its urſe upwards and ſomewhat backwards, nters the *Tympanum*, lying concealed very oblique *Sulcus*, which is exca- ed directly above the Bone which has Groove in it, into which the *Mem- na Tympani* is inſerted. This *Sulcus* is which is ſeen in the upper part of bony Circle of the *Fœtus*, which we l treat of in the Sequel. This Muſ- after it enters into the *Tympanum* is ediately inſerted into the thin Proceſs the *Malleus*, which has already been ribed. *See* Plate V. Fig. I. Plate VI. IV, *and* V; *and* Plate VII. Fig. I, II.

4thly, *Three Muſcles, two of which belong to the* Malleus, *viz. The External.*

And the Internal Muscle. The second Muscle may be called Ir
ternal, because it is hid in a bony Sem
Canal, situated in the *Os Petrosum*, whic
Bone makes one of the *Parietes Tympan*
One Part of this Semi-Canal is witho
the *Tympanum*, and is contained in th
Top of the Passage, which goes fro
the Ear to the Palate: The other Par
which is within the *Tympanum*, advances
far as the *Fenestra Ovalis*, and forms
this Place a little Ridge, upon which th
Tendon of the Muscle runs, as upon a Pu
ley, passing from one Side of the *Tymp*
num to the other, and is inserted into th
posterior Part of the Handle of the *Ma*
leus, a little below the Insertion of the e
ternal Muscle, to draw it towards the
Petrosum. The Origin of this Muscle
exactly at the Place where the bony Pa
of the Aqueduct ends; it is cover'd with
nervous Coat, which forms a Sheath, whi
accompanies it in all its Course, and firm
ly connects it to the Semi-Canal. S
Plate VI. Fig. I, IV, *and* V.

And one to the Stapes. The Muscle of the *Stapes* is hid in
bony Tube, which is formed out of t
Os Petrosum, almost at the Bottom of t
Tympanum, from whence this Muscle tak
its Origin: It has a large fleshy Bell
which ends suddenly in a very small Te
do

n, which is inserted into the Head of e *Stapes*. The Tube which encloses the lly of this Muscle is about two Lines ng, and is much larger at its End, where e Tendon of the Muscle passes through *See* Plate V. Fig. VIII. *and* Plate III. Fig. I.

The last Part to be taken notice of in e *Tympanum*, is the small Branch of a erve which passes behind the *Membrana mpani*, which some have mistook for e Tendon of one of the Muscles which long to the *Malleus*; but which is a anch of the fifth Pair of Nerves, which all afterwards be described. *A Branch of a Nerve.*

The above-mention'd two *Fenestræ*, ve each of them an opening into a Ca- y, which is excavated out of the *Os Pe- sum*, which is call'd *Labyrinthus*, from being very intricate, because of its ma- Windings: This Cavity is divided in- three Parts; The First is that which y be called the *Vestibulum*, or Entry of Labyrinth, because it leads to the two ers; The Second Part contains three nd Canals, which being curv'd in the lf Circle, I shall in the Sequel call them three *Canales Semi-Circulares*; they are ced on that Side the *Vestibulum*, to- rds the back-part of the Head: the *The second Cavity of the internal Ear called the Labyrinth, is divided into three Parts.*

Third Part is the *Cochlea*, which is situated on the contrary Side.

1st. The Vestibulum. The *Vestibulum* is a Cavity almost round, formed out of the *Os Petrosum*, and about a Line and a half in Diameter: It is situated behind the *Fenestra Ovalis*, and covered on the Inside by a Membrane, furnish'd with a great many Vessels. There

Which has nine Foramina. are nine *Foramina* in it, of which one has been already described, *viz.* the *Fenestra Ovalis*, which forms an Entrance from the *Tympanum* into the *Vestibulum*; the other eight are in the Cavity of the *Vestibulum*. The first leading into the upper Range of *Scala* of the *Cochlea*; there are five more which afford an Entrance into the three Semi-circular Canals, and the two last through which two Branches of the *Portio Mollis* of the auditory Nerve pass.

2dly, The three Canales Semi-circulares, *viz.* I shall give Names to the three *Canales Semi-circulares* to distinguish them, and shall take those Names from their Situation: The first I call *Superior*, because it takes up the upper Part of the Arch of the *Vestibulum*; the second *Inferior*, because it surrounds its lower Part and the third, which is placed more towards the Outside, and is situated betwixt the other two, *Medius*.

The

The *Canalis Semi-circularis Superior* Canalis Semi-circularis *Superior.*
ſſing out of the *Veſtibulum*, runs from
e fore-part to the back-part, afterwards
owing curv'd turns a little from the
ck to the fore-part, proceeding as far
the Middle of the poſterior Part of the
Petroſum, making a little more than
Half-Circle, and there it unites with the
nalis Inferior.

The other which I call *Canalis Inferior*, *Inferior.*
mes from the inferior Part of the *Veſti-*
lum, and forms alſo a little more than a
mi-Circle, and joins itſelf to the ſupe-
or Canal, as has been before deſcribed.
heſe two Canals being joined together
rm but one, which advancing forwards
little obliquely, opens into the Middle
the *Veſtibulum.*

The third, which I call *Medius*, has its Medius.
o ſeparate Orifices, and forms no more
an its Semi-Circle. The Bore of theſe
nals is ſometimes round and ſometimes
al, and is enlarg'd towards their Ex-
mities, like the broad End of a Trum-
t.

The ſix Extremities of theſe three *Ca-*
les Semi-circulares, form only five Ori-
es into the *Veſtibulum*, ſince there is one
theſe Orifices common to both the
tremities of the ſuperior and inferior

Canals, as aforesaid. These Orifices ar disposed in such a Manner, that there ar two at the Top, two at the Bottom, an one in the Middle of the *Vestibulum*.

The first, to begin from the Top to th Bottom, is the Orifice of the *Canalis Sem circularis Superior*, the other is one of th Orifices of the *Canalis Medius*: These tw Orifices are separated near their Entranc into the *Vestibulum*, only by a small bon Ridge, which ends insensibly as it enter into the *Vestibulum*.

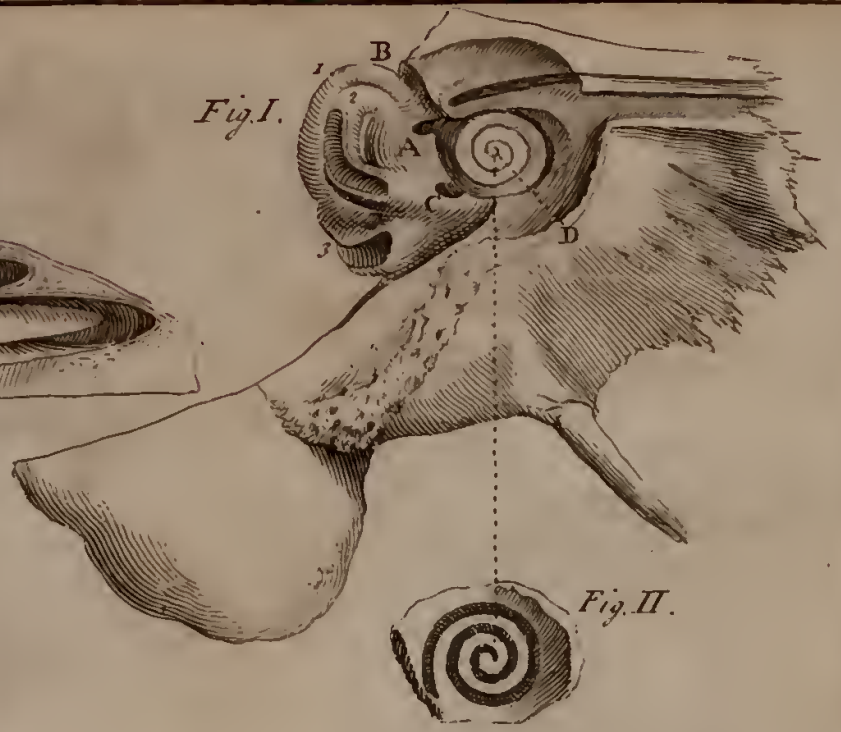
As for the two Orifices which are at th lower Part of the *Vestibulum*; the first reckoning from the Top to the Bottom is that of the *Canalis Inferior*, and tha which is situated above it is the othe Orifice of the *Canalis Medius*.

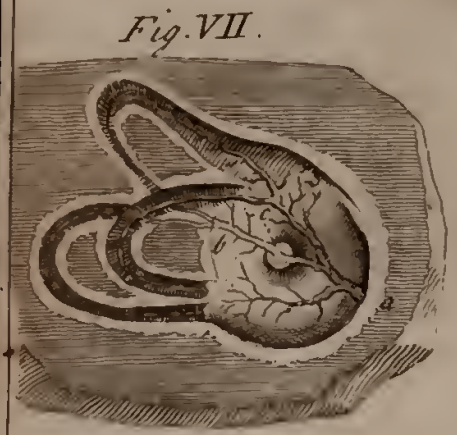
The Orifice which is in the Middle o the *Vestibulum*, and which is the larges of them all, is that which is common t the superior and inferior Canals. *See* Plat X. Fig. I, IX.

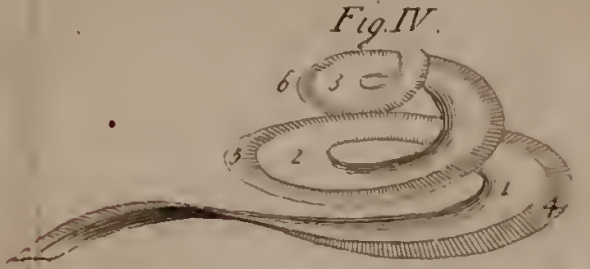
Explanation of Plate X.

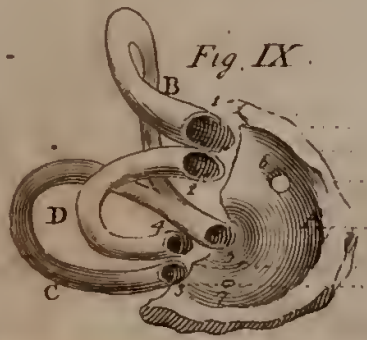
Fig. I. *represents the temporal Bone twic as large as Nature; it is prepar'd in such a manner that it shews the* Cochlea, *and th Semi-circular Canals in their natural Situation.*

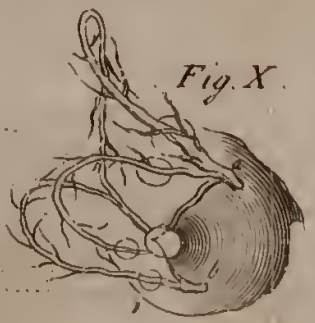
Plate X.

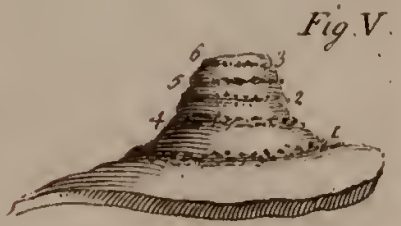












B Cole Sculp

tion. A, *the Vault of the* Veſtibulum. , *the* Feneſtra Ovalis, *mark'd by a punc-r'd Line.* C, *the* Feneſtra Rotunda *pen.* D, *the* Lamina Spiralis *mark'd by punctur'd Line, diveſted of the ſpiral anal which covers it, and of the Mem-rane which connects it to the Surface of this anal.* 1, 2, 3, *the three Semi-circular anals in their natural Situation.* 1. *the perior.* 2, *the Middle.* 3. *the Inferior. he Middle, and the Inferior are open, to ew that they are hollow.*

Fig. II. *repreſents the Inſide of the Co-ring of the* Cochlea *taken off, to ſhew the mi-oval Spiral Canal.*

Fig. III. *repreſents the Height of the* ochlea *much larger than Nature, to ſhow thus, The fore-part of its Covering only taken off by a perpendicular Section: This ews how the* Lamina *makes two Turns d a Half round the Axis, how it is fix'd the Surface of the Canal which ſerves as Arch to it, and how the Sides of this anal, which are connected to the Axis, be-me as thin as the* Lamina. A, *the infe-or Portion of the* Veſtibulum, *which is t into this Figure, and only left to ſhew w the* Lamina Spiralis *proceeds out of its avity, and paſſes before the* Feneſtra Ro-nda. B, *the* Feneſtra Rotunda *clos'd up*

by a thin Membrane, like the Membrana Tympani. 1, 2, 3. *The two Circumvolutions and a half of the* Lamina Spiralis *round the Axis.* 4, 5, 6, *The two Turns and a half of the Spiral Canal.*

Fig. IV. *repreſents the* Lamina Spiralis *in the Air much larger than Nature, with the Membrane which connects it to the Surface of the Canal.* 1, 2, 3, *The* Lamina Spiralis. 4, 5, 6, *The Membrane which is fix'd to it, and which is diſtinguiſh'd from it by a Line, which is drawn between both.*

Fig. V. *repreſents the Axis much larger than Nature, upon which the Traces of the Circumvolutions of the* Lamina Spiralis, *and of the Spiral Canal are remarkable.* 1, 2, 3. *The Traces of the Windings of the* Lamina Spiralis, *which are perforated by a great many* Foraminula, *which afford a Paſſage to the Filaments of the auditory Nerve.* 4,5,6. *The Traces of the Side of the Spiral Canal.*

Fig. VI. *repreſents the* Cochlea *ſtanding, and half of it cut perpendicularly off, much like* Fig. III. *except that all the Bone is here taken away: This Figure is made for the better comprehending that third Figure, and for its Explanation it is ſufficient to remark, that the* Lamina *appears here diſengag'd from the Surface of the Canal, that it may ſhew the Inſide of this ſame Canal, and how its*

s Sides are elongated to be connected to he Axis.

Fig. VII. *represents the* Vestibulum *and he three Semi-circular Canals open, to shew he Distribution of their Vessels.* a, *the ranch of an Artery which enters into the* estibulum. b, *a Ramification of this rtery, which passes through the common rifice of the* Vestibulum, *and which is stributed into the superior and inferior Ca- ls.* c, *the Ramification which furnishes e middle Canal.*

Fig. VIII. *represents the Arteries of the* ochlea, Vestibulum, *and three Semi-cir- lar Canals.* A, *the* Fenestra Rotunda. , *the Orifice of the Passage which gives ntrance to the Vessels, which is at the En- ance of the* Scala Inferior *of the* Cochlea; *shews that one Part of these Vessels is di- ributed into the* Cochlea, *and the other in- the* Vestibulum, *and the three Semi- rcular Canals; these last are represented in the Air.*

Fig. IX. *represents a Portion of the* estibulum *and the three Semi-circular anals in the Air, to shew their natural tuation and their Orifices.* A, *the In- rior Portion of the* Vestibulum. B, *the perior Canal.* C, *the Inferior.* D, *the iddle.* 1, *the Orifice of the superior Semi-*

Semi-circular Canal. 2, *the first Orifice the middle Canal.* 3, *the Orifice of t inferior Canal.* 4. *the other Orifice of t middle Canal.* 5, *the common Orifice to t superior and inferior Canal.* 6, *the first* F ramen, *which affords an Entrance to one the Branches of the* Portio Mollis. 7, *t second* Foramen, *which affords an Entran to another Branch of the same Nerve.*

Fig. X. *represents the* Vestibulum, *the same Disposition as in the preceed Figure, with the Nerves of the three Se circular Canals in the Air.* a, *a Bra of a Nerve, which enters into the* Vestib lum *by a* Foramen *mark'd* 6, *in* Fig. I *It is divided into three Branches, the fi of which enters into the Orifice of the super Semi-circular Canal, the second into the perior Orifice of the middle Canal, and third which is the least descends to c itself into the common Orifice.* b, *the Bra which enters by the* Foramen, *mark'd in* Fig. IX. *and is divided into two Ram fications, the Inferior of which enters i the Orifice of the inferior Canal, and other advances into the common Orifice, c unites with the third Ramification of Branch mark'd* a. *These Nerves are rep sented somewhat larger than Nature.*

On that Side of the *Vestibulum* near the Face, opposite to the three Semi-circular Canals, we meet with the third Part of the Labyrinth, call'd the *Cochlea*, which is compos'd of two Parts, *viz.* Of a Semi-oval spiral Canal, and a *Lamina*, which runs spirally upwards. This *Lamina* follows the Course of the Canal, and separates it into two.

3dly, The Cochlea, in which two Things are to be taken notice of, viz.

This Semi-oval Canal is excavated out of the interior Part of the *Os Petrosum*, covers the *Lamina Spiralis* in the Form of a Vault, and which makes a Dint in the Surface of this Bone, which advances forwards into the Inside of the *Tympanum*, opposite to the *Membrana Tympani*: This Dint is elongated and terminates in a small Ridge, which makes the Separation between the two *Fenestræ*, as above-described. The Canal makes two Turns and a half round the Axis, diminishing and growing narrower as it proceeds upwards: Its Sides, which are fix'd to the Axis, diminish so much of their Thickness, the nearer they approach it, that they appear as thin as the *Lamina*.

1. *The Semi-oval Canal.*

The *Lamina Spiralis* separates this Canal into two Parts, in which it is contain'd, being fix'd to the Axis by its *Basis*, and by its other Extremity to the Surface of

2. *The* Lamina Spiralis.

of the Canal oppoſite to the Axis, by means of a very fine Membrane, much thinner than the *Lamina*, and of a darker Colour which does not proceed in a plain *Superficies* like the *Lamina*, but turns a little downwards. This Membrane, as it unfolds itſelf, lines the interior Part of this Canal: It is eaſy to imagine, that in taking out the Axis from this Vault in the *Cochlea* which ſurrounds it, there muſt of Neceſſity appear four entire Rounds, and two half Rounds, *viz.* Two Rounds and a half of the Semi-oval Canal, and two Rounds and a half of the *Lamina Spiralis*. This *Lamina* is hard and brittle; its Baſis near the Axis is perforated with many oblique *Foraminula* in the ſame manner as the Axis is; the other Extremity of the *Lamina* is very thin, firm, and tenſe.

Which is fix'd to the Canal by a very fine Membrane,

The Canal of the *Cochlea* being thus divided into two *Scalæ* or Ranges of Stairs in the *Cochlea*, built upon the ſame Axis, one above another, which have no Communication one with another, they have only two ſeparate Orifices, one of which forms an Entrance from the *Veſtibulum* into the *Scala Superior* of the double Range; the other, which is the *Feneſtra Rotunda*, affords a Paſſage from the *Tympanum* into the *Scala Inferior*.

And which divides this Canal into two.

See

Plate X. Fig. I, II, III, IV, V, *d* VI.

There is an Orifice in the inferior Part the *Os Petrosum*, below that through ich the auditory Nerve enters, which ms a Passage for an Artery and a Vein, ich are Branches of the internal Caids and Jugulars: This is the Entrance a Canal, which proceeding about the ngth of a Line and a half, opens into *Scala Inferior* of the *Cochlea*, near the *neſtra Rotunda*. These Vessels entring his Place divide themselves into a great ny Branches, which are distributed to *Lamina Spiralis*, and to the Membane that lines the Inside of the Spiral nal. This Artery also in its Entrance nishes a considerable Branch to the *Vestibulum*, which as it enters is divided o two Ramifications, one of which is tended on the right Side, and the other the left. These two Ramifications ae commonly subdivided again into two ore, one of which enters by the Orifice the *Vestibulum*, which is common to the perior and inferior Semi-circular Canals, d divides itself into two small Filaents, which are distributed on the Inside these Canals: the other Branch entring the superior Orifice of the middle Canal,

And 3dly, The Arteries and Veins of the Cochlea,

And of the Vestibulum.

nal, re-enters into the *Veſtibulum* by other Orifice. Theſe Ramifications for *Anaſtomoſes* in many Places in the Inſi of the *Veſtibulum* : The Veins follow t ſame Courſe as the Arteries.

4thly, The implanted Air. Since the two *Feneſtræ*, which ent into the Cavities of the Labyrinth, a exactly ſtopt up, one by the Baſis of t *Stapes*, the other by its Membrane, it eaſy from hence to conclude, that th Air which is confin'd in this Place c have no Communication neither with th in the *Tympanum*, nor conſequently wi the external Air ; and this Air is th without doubt which Anatomiſts hav term'd Implanted Air. *See* Plate X. Fig VII, *and* VIII.

The other Parts of the Organ *of* Hearing, *are the Canal of the auditory Nerve.* The Canal through which the auditor Nerve paſſes is very large. It is form' out of the middle of the hinder Part c the *Os Petroſum* next the Brain, and pro ceeding obliquely backwards about th Length of two Lines, it forms an imper vious Paſſage, whoſe Bottom is partl terminated by the Baſis of the *Cochlea* and partly by a Portion of the Arch o the *Veſtibulum* : At the Extremity of thi impervious Paſſage there is a ſmall bony *Septum*, which ſeparates the Baſis of th *Axis* from the *Foramen*, through whic

e *Portio Dura* of the auditory Nerve
ıſſes.

The *Nervus Auditorius* ariſes from the Nervus Auditorius.
pſterior Side of that Protuberance, which
lodern Anatomiſts have call'd *Annular*,
out the Diſtance of a Line from a ſmall
obule of the *Cerebellum*, which is fix'd to
e Origin of this *Proceſſus Annularis*:
his Nerve is compos'd of two Branches, *Is divided into two Branches*, viz.
e uppermoſt of which is the largeſt, and
rm'd *Portio Mollis*, becauſe it is not *The* Portio Mollis.
ly in Reality more tender and ſoft than
at which accompanies it, but alſo than
l the other Nerves of the *Medulla oblongata*, except the Olfactory Nerves. The
ferior Branch is called *Portio Dura*, not
ly becauſe it is more fibrous and com-
ct; but alſo becauſe it paſſes out of the
ranium, whereas the *Portio Mollis* loſes
elf in the *Organs* of *Hearing*. Theſe two
anches run ſtrait and parallel as far as
e *Foramen* of the *Os Petroſum*, proceed-
g about the Length of three Lines;
nd as ſoon as they enter into it, the *Portio*
ura paſſes above the other. It is at the *The* Portio Mollis *divided into three Branches*; *the largeſt of which is diſtributed into the* Axis *of the* Cochlea
ottom of this impervious Paſſage which
e have already deſcrib'd, that the *Portio*
Mollis is divided into three Branches; the
oſt conſiderable of which being come to
e Baſis of the *Axis*, ſeems to terminate

and

and be loſt in this Place: Whereas in reality it enters into thoſe above-mention'd oblique *Foraminula*, and is divided into many ſmall Filaments which are diſtributed to each Winding of the *Lamina Spiralis*. The Diviſion and Diſtribution of this Nerve may well be compared with that of the Olfactory Nerve, which being come to the Root of the Noſe ſeems to be terminated in this Place, and many Anatomiſts have believed that it really terminates here; but if they examine it ſtrictly, they would find the Nerve divided into ſmall Fibres, which are cover'd with the *Dura Mater*, paſſing thro' the ſmall *Foramina* of the *Os Cribroſum*, and entring into the Cavity of the Noſtrils, are diſtributed to the Membrane, which lines the *Laminæ* of the Noſe. *See* Plate XI. Fig. I, II, *and* III.

Explanation of Plate XI.

Fig. I. *repreſents the Baſis of the* Cerebrum *diveſted of all its Veſſels, to ſhew the Origin of the ten Pair of Nerves, which proceed from the* Medulla Oblongata; *all that Part of the Subſtance of the* Cerebrum, *which Mr.* Willis *cal'd its Poſterior Lobes, is cut off*; i. e. *the Inciſion paſſes through that*

Fig. I.

Fig. II.

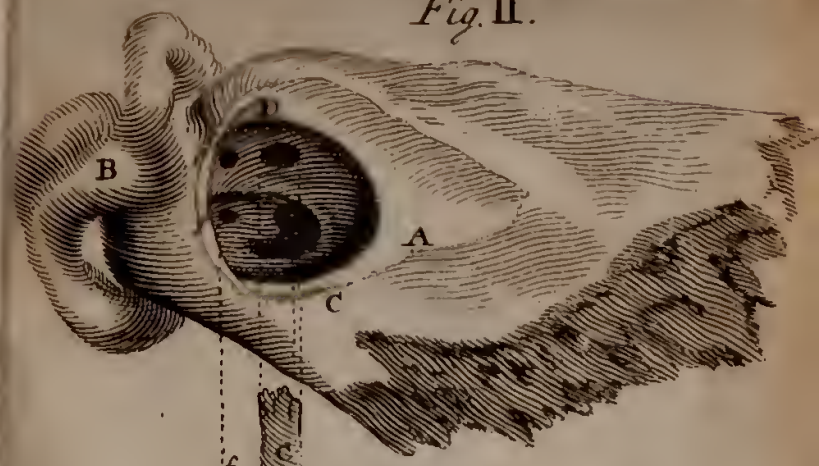
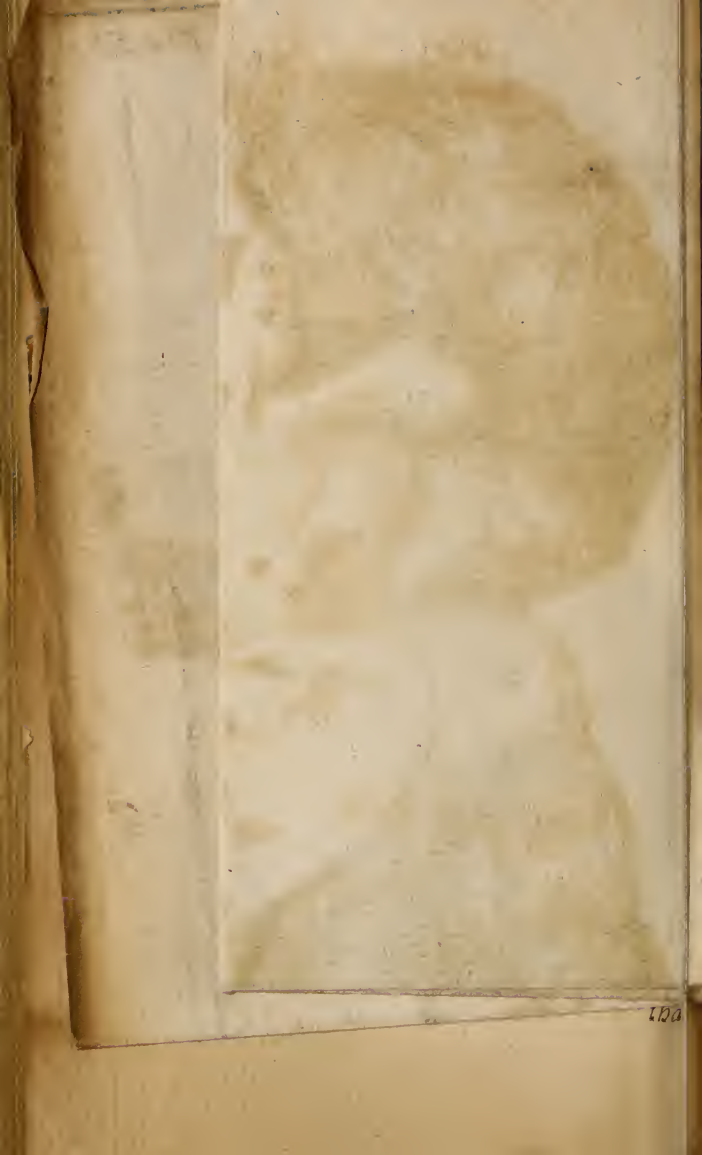


Fig. III.

B. Cole, Sculp.



Place, where a great lateral Branch he carotid Artery is sent off upon the ſtance of the Cerebrum, *into the Inter- of its Lobes: This Inciſion ſerves to over the true Origin of the firſt Nerves, to place the* Cerebellum, *which in a ers'd Brain is always found ſupported by poſterior Lobes, in the ſame* Superficies *he* Cerebrum; *which is abſolutely neceſ- y to ſhew the true Figure of the* Medulla longata, *and the Origin of all the Nerves ich proceed from it.* A A, *the fore- t of the* Cerebrum *revers'd.* B B, *the* rebellum. C C, *the Place where a rt of the* Cerebrum *has been cut off; s Cut is mark'd but on one Side, but we y ſuppoſe the ſame on the other.* D D, Corpora Striata, *which are the Origins the* Medulla Oblongata, *their poſterior rt is here ſhewn, and a Portion of them ut off with the* Cerebrum. E E, *the* ervorum Opticorum Thalami. F, *the* edulla Oblongata, *whoſe two Branches e united in this Place, although Mr.* Willis ncied *they were divided.* G, *the* Proceſ- s Annularis. H H, *the firſt Pair of erves, nam'd the Olfactory, which take eir Origin from the Baſis of the* Corpora riata, *by a medullary Fibre mark'd* h h, *d which increaſes in Bulk in the Place where*

where they wind about, near the [illegible] *Nerves.* I I, *the optic Nerves, or the* [illegible] *cond Pair of Nerves, which from their* [illegible] *gin from the* Thalami *are ſhewn as fa* [illegible] *to their Exit out of the* Cranium. K *the third Pair of the Nerves, call'd* C lorum Motorii. L L, *the fourth Pai Nerves, call'd* Pathetici. M M, *the f Pair of Nerves.* N N, *the ſixth Pai Nerves.* O O, *the auditory Nerves, wh form the ſeventh Pair; they are divided f their Origin into two Branches, the lar of which, which is the uppermoſt, is* Portio Mollis. P P, *the eighth Pair Nerves, which proceed out of the* Medul *below the two Eminencies mark'd y* Q Q, *the ninth Pair of Nerves, whic mark'd but on one Side of the* Medulla, *a is even placed out of its Direction, for fe of rending the Figure puzzling, on the oth Side we have contented ourſelves with ſhe ing the Origin.* R R, *the tenth Pair Nerves which proceed out of the* Medul Oblongata, *which Mr.* Willis *has confoun ed with the firſt vertebral Pair.* S, *the* M dulla *cut off at its Entrance into the* Ve tebræ. T T, *the two Nerves which pr ceed out of the* Medulla Spiralis, *in t Inſide of the Cavity of the* Vertebræ *of th Neck, and aſcend up into the* Cranium,

ited to the eighth Pair of Nerves. u, nfundibulum. x x, *two small medul- Proceſſes, which Mr.* Willis *has taken ſlands.* y y, *two Eminences of the* ulla *form'd in the Shape of Olives, h Mr.* Willis *has call'd* Corpora Py- dalia. z z, *two ſmall Filaments of es which proceed out of the* Medulla, *united to thoſe Nerves which come from pine, and are join'd to the eighth Pair ; imes two or three of theſe Filaments of es are found on each Side.*

g. II. *repreſents the back-part of the* Petroſum *much larger than Nature, as much of it taken off as was neceſſary cover the three Semi-circular Canals, the impervious Paſſage, which termi- the Canal of the auditory Nerve, and ew all the* Foramina *which we find* . A, *the Canal of the auditory Nerve off.* B, *the Semi-circular Canals. he Baſis of the* Axis *of the* Cochlea, *'d by a great Number of ſmall* Fora- nula, *which give Entrance to the ner- Filaments, which are diſtributed to all urnings of the* Lamina Spiralis. D, *Entrance of the Canal which incloſes the* io Dura. e, *the* Foramen *which gives ance to the Branch mark'd* e *in* Fig. III. *nother* Foramen *which gives Entrance to*

to the third Ramification of the Portio M
lis, *mark'd* f, in Fig. III.

Fig. III. *repreſents the auditory N*
much larger than Nature, which apt
as if it were torn off from the Os Pe
ſum, *to ſhew how it is divided at the*
tom of the Paſſage. A, *the auditory N*
divided into two Branches. B B, *the* Pc
Mollis. C C, *the* Portio Dura, *par*
which is plac'd at the Top of the Figure
ſhew the Filaments of one of the Bran
of the Portio Mollis; *the Trunk of*
Portio Dura *enters into the* Foramen *n*
ked D, *in* Fig. II. D, *a large Branc*
the Portio Mollis, *which is divided*
great many ſmall Filaments which e
into the Foraminula, *which are ſitu*
at the Baſis of the Axis *of the* Cochl
and are diſtributed to all the Circumvo
tions of the Lamina Spiralis. e, *anot*
Branch of the Portio Mollis, *which*
ters into the Foramen, *mark'd* e, *in* Fig.
f, *the third Branch of the* Portio Mol
which enters through the Foramen, *mar*
f, *in* Fig. II. *See the Diſtribution of th*
two laſt Branches in Plate X. Fig. X.
Branch e, *is there mark'd by the Letter*
and the Branch f, *by the Letter* b.

T

'he two other Ramifications of the *tio Mollis*, are for the uſe of the *Veſ-lum.* The moſt conſiderable of theſe Branches run in at the Entrance of Canal of the *Portio Dura*, and af-'ards enters obliquely into a parti-r *Foramen*, which opens into the h of the *Veſtibulum* at the ſide of Orifice of the ſuperior Canal of the *lea:* This Ramification, as it enters, ıs a ſort of a Tuft, one Part of ch proceeds into the Orifice of the rior ſemi-circular Canal, and into of the anterior or middle Canal, join-them together, and partly ſhutting n up; afterwards it furniſhes a ſmall ous Filament to each of theſe Canals, ng it ſelf to an Artery which is di-uted to theſe Parts, and proceeding y where with it in the ſame Courſe; other Part of the Tuft is elongated he bottom of the *Veſtibulum*, and luces a ſmall Twig, which enters into ommon Orifice.

The two other Branches into the Veſtibu-lum.

And into the Semi-circular Canals.

'he ſecond Branch of the *Portio Mol-*which is deſtin'd for the uſe of the *bulum*, enters into a very oblique *men*, which opens a little below the 'e deſcrib'd Branch: This Nerve at ntrance into the *Veſtibulum*, is di-

vided into two ſmall Twigs; one which enters into the Orifice of the ferior Canal, which is ſituated at bottom of the *Veſtibulum*, and the ot aſcends towards the common Orifice. theſe ſmall Ramifications of Nerves, h a Communication with one another. Plate X. Fig. X.

The Portio Dura,

The *Portio Dura* enters into a *Fo men*, ſituated near the upper Part the *Fundus* of that impervious Paſſa which we have already deſcrib'd. T *Foramen* is the entrance of the bony Ca which is form'd out of the *Os Petroſ* running obliquely towards the *Tympan* into which it does not penetrate, but ly inſinuates it ſelf into the Surface the *Os Petroſum*, which makes one of *Parietes* of the *Tympanum*. This Ca proceeding down to the Top, and by Side of the *Feneſtra Ovalis*, and to upper Part of the little Canal, which cloſes the *Muſculus Stapedis*, deſcends lower; and having proceeded about lines and an half, being all along ver'd by the *Os Petroſum*, it paſſes thro' a *Foramen*, which is between *Maſtoid* and *Styloid Proceſſes*. T Nerve before it protrudes out of its *Fo men*, receives a Ramification from

Ne

Fig. I.

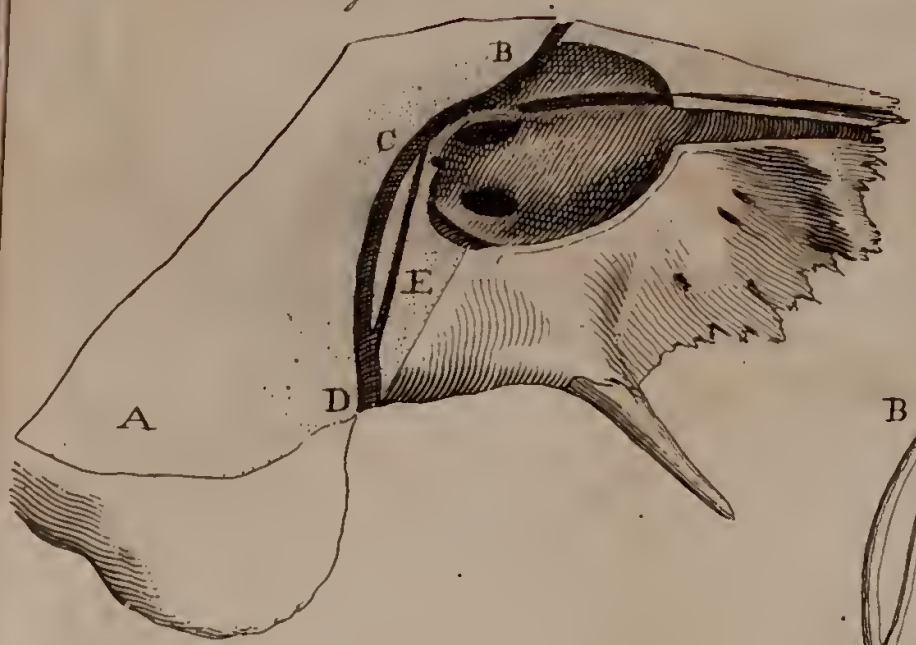


Fig. II.

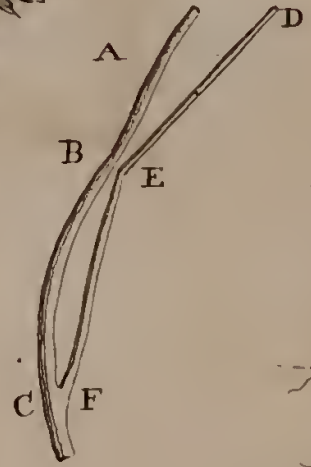


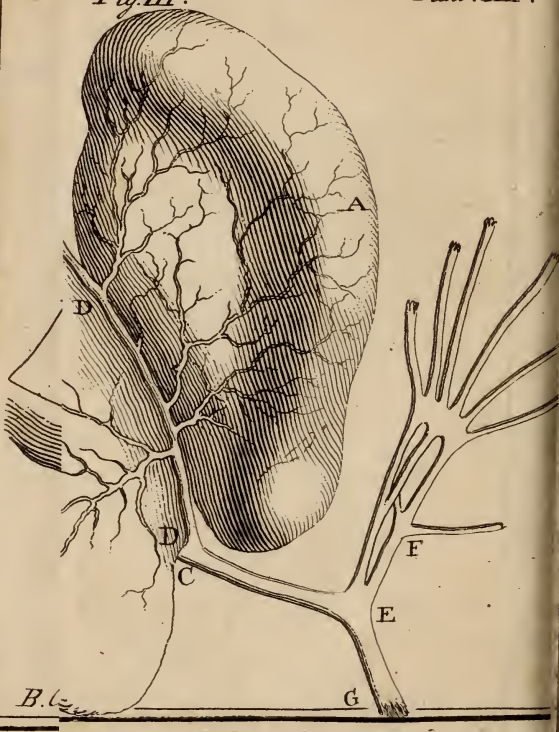
Fig. III.

B. Cole, Sculp.

to Fa

Fig. III.

Plate. XII.



rve of the fifth Pair, which paſſes be-
d the *Membrana Tympani*, which we
ll deſcribe in the Sequel. This ſame
rtio Dura at its Exit out of the *Fora-*
n, furniſhes a Ramification, which aſ-
ding towards the back part of the
, is expanded over all the Parts of
exterior Ear, and near the *Proceſſus*
mmillaris. It furniſhes many other
nches which are diſtributed to other
ts, of which we ſhall treat at the End
this Deſcription. *See* Plate XI. Fig.
Plate XII. Fig. I, II, and III.

Which produces as it paſſes out of the Cranium, *a Ramification which is expanded over the back part of the Ear.*

Explanation of Plate XII.

ig. I. *repreſents the Surface of the* Os
roſum, *twice as large as Nature, to*
the bony Canal, thro' which the
tio Dura *paſſes, and that thro' which*
Chorda Tympani *deſcends to be join'd to*
Portio Dura. A, *the* Proceſſus Mam-
aris. B, C, *the bony Canal which is*
he Tympanum. C, D, *part of the*
e Canal which is ſituated without the
mpanum, *and which is excavated out*
he Os Petroſum. *Its Extremity lies*
veen the Proceſſus Mammillaris *and*
oides. E, *the little Canal of the* Os
roſum, *thro' which the ſmall Nerve of*

the Tympanum *passes to be join'd to t*
Portio Dura.

Fig. II. *represents the* Portio Du
bare, extracted from its Canal, with t
little Chorda *which crosses the* Tympanu
A, B, *part of the* Portio Dura, *whi*
is inclos'd in the Tympanum. B, C, *pa*
of the Portio Dura, *which is conceal'd*
the Os Petrosum. D, E, *that part of*
Chorda *which crosses the* Tympanu
E, F, *part of the same* Chorda, *wh*
passing out of the Tympanum, *hides it*
in the little Canal, mark'd E, *in the fi*
Figure of this Plate, and which is join'd
the Portio Dura. F, *the place where t*
little Nerve joins with the Portio Dura.

Fig. III. *represents the Ear rever*
to show the Ramification of the Por
Dura, *which is distributed upon it.*
the Ear revers'd. B, *the* Proce
Mammillaris. C, *the Trunk of the* P
tio Dura, *passing out of the* Os Petrosi
D, D, *the first Ramification of this Ne*
which ascends up the back Part of
Ear, and distributes a great many
laments to it, and to the Processus Ma
millaris. E, *the Division of the* Po
Dura *into two Branches.* F, *the supe*
Branch. G, *the inferior Branch.*

The little Nerve which croſſes the *Tympanum*, takes its Origin immediately from a Branch of the fifth Pair, which proceeding downwards, is diſtributed on the Side of the Tongue; afterwards this Nerve reaſcends up to the exterior Side of the bony Canal of the Aqueduct, and following the Courſe of the external Muſcle of the *Malleus*, upon which it is plac'd, it enters into the *Tympanum* through the ſame *Foramen*; afterwards it repaſſes under the Tendon of the external Muſcle, and deſcending obliquely backwards, it leans upon the *Membrana Tympani*, and paſſing before the long Branch of the *Incus*, it comes out of the *Tympanum*, running into a ſmall Canal, which is form'd out of the *Os Petroſum*, and joins to the Trunk of the *Portio Dura*, a little before the *Portio Dura* is protruded out of its Canal. It is this ſmall Thread of a Nerve, which Anatomiſts have conſider'd as the *Chorda Membranæ Tympani*, and which they fancied might cauſe ſome Sound in communicating its Agitations to this *Membrane*, in the ſame manner as a Cord does, which they put upon a Skin of a Drum. But although it is true, that the *Chorda* touches the *Membrana Tympani*,

The Chorda Tympani, *is a Nerve which is a Branch of the fifth Pair.*

Which is join'd to the Trunk of the Portio Dura.

pani, if we but examine its Structure, w
ſhall ſoon diſcover its Uſe. For beſid
its Origin, which plainly makes it appe
that it is a Nerve, its diſtribution lea
no room to doubt of it; there being
other Nerve, which is diſtributed either to t
Muſcles or the *Officula*, or to the oth
Parts which are contain'd in the *Tym*
num. *See* Plate VII. Fig. I, *and* II. Pl
XIII. Fig. I. *and* Plate XII. Fig. I, *and*

Explanation of Plate XIII.

*This repreſents the whole temporal B
as large as Nature, ſomewhat revers'd,
the under Part ſhewn, with the Branc
the fifth Pair of Nerves, which is diſt
buted to the lower Jaw, to ſhew the Or
and Courſe of that ſmall Twig of a Ner
which is call'd the* Chorda Tympani, *
the diſtribution of another Ramification of
ſame Nerve, which goes to the external E*

A, *the ſcaly Part of the temporal B*
B, *the* Proceſſus Mammillaris. C,
Proceſſus Styloides. D, *the* Zygo
ticus. E, *the Paſſage which goes from
Ear to the Palate.* F, *the Branch of
fifth Pair call'd the inferior maxil
Nerve, becauſe it is particularly diſtrib
to the lower Jaw, and to the Part w*

Plate XIII

B Cole Sculp

rrounds it. 1, 2, 3, 4. *Four Ramifica-ns that this Branch furniſhes immediately ter its Exit from the* Cranium, *the* 1. *of hich goes to the temporal Muſcle.* 2. *to the ternal Maſſeter.* 3, *to the* Buccinator, *id to the Glands of the Cheek.* 4. *to the* terygoideus internus. G, *another Ra-ification which it alſo ſends off at its it.* H, *a Branch of this Ramifica-n, which goes to join the Ramification of e* Portio Dura, *mark'd* 6, *in the* XVIth *late.* I, *the Diſtribution of the Ramifi-tion* G, *to the external Ear, the Bran-es of which are cut off.* K, *the Branch hich enters into the lower Jaw cut off.* , L, *the Branch which goes to be diſtri-uted to the Sides of the Tongue.* M, M, *Ramification of this Branch which aſ-nds over the bony Part of the Paſſage the Aqueduct, and enters into the* Tym-anum ; *and this is what is call'd the* horda Tympani. N, *the external Muſ-e of the* Malleus *in its Situation.*

Laſtly, The ſecond vertebral Pair ſends orth a conſiderable Branch, which goes p to the Ear: It creeps under the Skin, ne Length of the *Muſculus Maſtoideus*, nd of the parotid Gland, and parts into ree Branches near the Ear, one of

The ſecond vertebral Pair, furniſhes a Branch to the Ear.

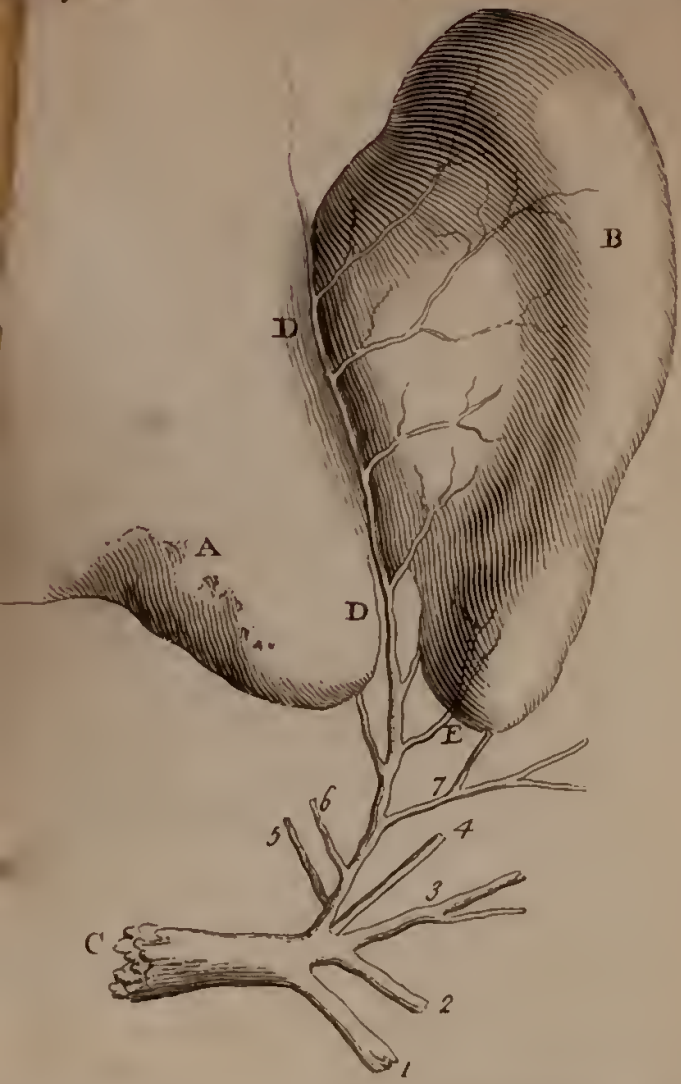
which is expanded upon the back Part, and upon the End of the Ear, and the third diſtributes its Fibres into the cartilaginous Paſſage.

It is here proper to take notice, that Mr. *Willis* makes this Branch of a Nerve proceed from the firſt vertebral Pair. The Reaſon of this is, that he ſuppoſes that the tenth Pair of the Nerves of the *Medulla Oblongata* paſſes out no where elſe but between the firſt and ſecond *Vertebræ* and ſo he reckons for the firſt Pair of the *Medulla Spinalis*, that which iſſues out into the *Interſtitiæ* of the ſecond and third *Vertebræ*: But the Reaſon of this Error proceeds from his not knowing the Egreſs of the tenth Pair, which he has confounded with the firſt vertebral Pair; tho', theſe two Nerves have different Origins, Exits, and Diſtributions. *See* Plate XIV. Fig. I.

Explanation of Plate XIV.

A, *the* Proceſſus Mammillaris. B *the back Part of the Ear.* C, *the Trunk of the ſecond vertebral Pair.* 1, 2, 3, 4, 5, 6, 7. *Many Branches cut off, that this Nerve ſends to the neighbouring Muſcles, and to the vertebral Nerves.* D, D *th*

Plate. XIV.



Cole. Sculp.

e Branch of this Nerve, which ascends to the external Ear. E, *the Branch hich is lost in the Lobe of the Ear, and the cartilaginous Passage.*

There are many particular Things in the Ear of a Fœtus.

After having explain'd the Structure the Ear, in Subjects of eighteen or venty Years old, we thought it necessa- to take notice, in what it differs from ie Ear of a *Fœtus*.

1. *That Part of the auditory Passage, which is bony in Adults, is nothing but a Membrane in the* Fœtus.

1. The bony Canal of the auditory assage is, in the *Fœtus*, nothing but a retty hard Membrane, join'd by one of s Extremities to the cartilaginous Pas- ge, and by the other it adheres to the *lembrana Tympani*, by the help of a roove in the bony Circle, which we e going to describe: This Passage, hich in Adults is about five or six Lines ng, is not above a Line and a half in ngth; and what appears to us of it, is ally nothing else but what serves to form at part of the Canal, which grows flat wards the *Fundus*. *See* Plate XV. Fig. I.

xplanation of Plate XV. which repre- nts many Parts of the Ear of a *Fœtus*.

Fig. I. *represents the Ear of a Child e Year old.* A, *the under Part of the*

Ear. B, *its cartilaginous Paſſage.* C, *the Membrane which connects the cartilaginous Paſſage to the bony Ring, and which indurates afterwards to form the beginning of the bony Paſſage of the Ear.* D, *the bony Ring.* E, *the* Proceſſus Zygomaticus.

Fig. II. *repreſents the forepart of the temporal Bone of a* Fœtus. A, *the ſcaly Part, whoſe ſmall bony Fibres are eaſily diſtinguiſh'd, as they are alſo in all the other Bones which compoſe the* Cranium *of a* Fœtus. 2, 3, *the Sides of its Circumference, which are yet Cartilaginons.* B *the* Proceſſus Zygomaticus. C, *the* Membrana Tympani. D, *the bony Ring which receives the* Membrana Tympani. E, *the* Proceſſus Styloides, *which is as yet cartilaginous.* F, *the* Proceſſus Mammillaris, *which is yet very ſmall.* 4, *the* Foramen, *thro' which the* Portio Dura *paſſes out.* G, *this Letter marks an obſcure Line, which is the Place where the ſcaly Part is ſeparated from the* Proceſſus Mammillaris; *theſe two bony Pieces are exactly united in Adults.* H, *the Canal which incloſes the internal* Carotid. *the* Foramen *where the Tube which goes from the Ear to the Palate is connected.*

Fig

Fig. 2.

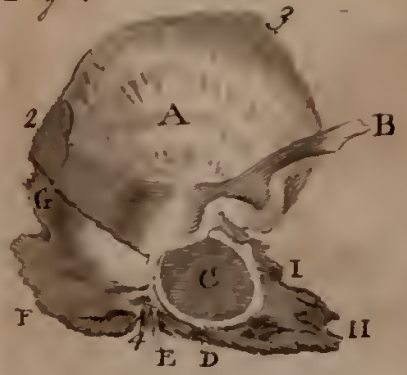


Fig. 3.

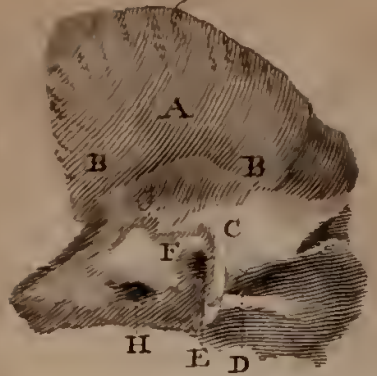


Fig. 5.

Fig. 4.

Fig. 6.

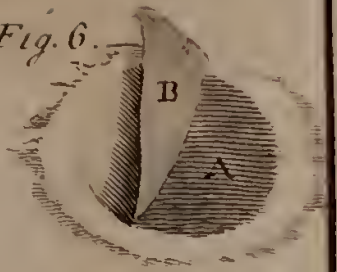
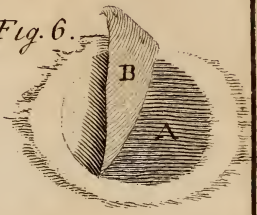


Fig. 1.

to Fa

Plate. XV.

Fig. 6.



B

Fig. III. *repreſents the back part of the* mporal Bone. A, *the ſcaly Part.* B, B, *the* lace *where it ſeparates from the reſt of the* Os Petroſum. C, *the ſuperior Semicircular* anal, *which is ſeen without any Prepara-* on. D, *the Inferior.* E, *the Place of* eir *Communication.* F, *A conſiderable* oſſa, *which is ſituated under the ſuperior* anal, *and which is fill'd up and effaced as* e Fœtus *grows older.* G, *a* Foramen, hich *is in the Paſſage of the* Portio Dura. I, *the* Foramen *of the auditory Nerve.*

Fig. IV. *repreſents the bony Ring, lean-* g *a little to ſhew the Groove.* A, *the bo-* y *Ring leaning on one Side.*

Fig. V. *repreſents the ſame Ring, lean-* g *in another manner, to ſhew the reſt of* s *Groove.*

Fig. VI. *repreſents the* Membrana ympani, *twice as large as Nature, half* f *it diſcover'd from a Membrane, which* vers *it.* A, *the* Membrana Tympani. , *a mucilaginous Matter indurated into a* Membrane *which covers it in the* Fœtus.

In the *Fœtus*, we find a Circle which 2. *There is a* plac'd exactly above the Entrance of *Circle.* he *Tympanum:* this Circle is eaſily ſepa- ated from the *Os Temporum*; and may lainly be ſeen with the *Membrana Tym-*

pani, when the Ear and auditory Paſſage is remov'd.

Which is not entire. This Circle is broke off about half a Line in its upper Part, near the Place where the Head of the *Malleus*, and the maſſy Part of the *Incus*, are conceal'd in the *Tympanum*; this interruption is found in Adults, as we have ſaid before, and in this Place the *Membrana Tympani* is directly fix'd to the Edge of the Extremities of the bony Canal, belonging to the external Ear.

It is hollow in the Inſide like a Gutter. In the Inſide of this Circle, there is a ſmall Cavity, which runs hollow through its whole Circumference, which forms the above-mention'd Groove, in which the *Membrana Tympani* is inchas'd. We muſt alſo take notice of a ſmall Sinuoſity in its ſuperior Part, upon which the external Muſcle of the *Malleus* runs: This Sinuoſity is alſo found in Adults.

This Circle is united to the bony Canal in Adults. Although this ſmall Circle is eaſily diſtinguiſh'd, and ſeparated in new-born Infants, yet it diſappears in Adults, and forming but one Body with the bony Canal, it is impoſſible to ſeparate it. One may diſtinguiſh it in Children of three or four Years old, but it is ſo ſtrongly fix'd to the temporal Bone, that it is not to be ſeparated from it. We muſt take notice that

at it begins to join by its two Extre-
ties, and insensibly through the rest
its circumference.

There is no room to doubt, but that the Groove into which the *Membrana Tympani* is fix'd, is the same as the Cavity in the bony Circle, since the *Membrana Tympani* has constantly the same situation, and the same Plan in the *Fœtus*, which it has in the Adult. *See* Plate XV. Fig. IV.

It has the same Plan, both in the Fœtus *as in the* Adult.

3. The Passage which goes from the ear to the Palate, which in Adults is partly bony, and partly cartilaginous, is almost entirely membranous in the *Fœtus*, and its bony Part becomes insensibly ossified, as the *Fœtus* advances in Age, in much the same manner as the bony Canal of the auditory Passage does.

3. *The* Aqueduct *almost entirely* Membranous.

4. During the Time, the *Fœtus* remains in the *Uterus*, the *Membrana Tympani* is cover'd with a mucilaginous Matter, which indurates into a *Membrane*, but afterwards it disappears. *See* Plate XV. Fig. VI.

4. *The* Membrana Tympani *is cover'd with a mucilaginous Matter.*

Besides these, in the posterior Part of the *Os Petrosum*, there are some pretty remarkable Differences to be seen.

The *Canalis semi-circularis Superior* of the *Labyrinth*, may be distinguished and

5thly, *The superior Semicircular Ca-*

nal, and a Portion of the Inferior are visible, without any Dissection.

and seen almoſt without any Preparation as may alſo a Portion of the *Canal Semicircularis Inferior*, at the Place where it communicates with the ſuperior.

6thly, *There is a* Foſſa *and a* Foramen, *in the* Os Petroſum.

2. Under the ſuperior Canal, there a conſiderable *Foſſa* to be ſeen, which diſappears as the Child grows older: And there is beſides, a *Foramen* in the upper Part of the *Os Petroſum*, and in the Paſſage of the *Portio Dura*, which is very remarkable in the *Fœtus*, and which alſo found in People of a very advanced Age, but is much more minute in the

7thly, *The ſcaly Part of the temporal Bone is ſeparable from the* Proceſſus Mammillaris, *which is very minute.*

3. The ſcaly Part of the *Os Temporum* is ſeparated from the *Os Petroſum*, the *Proceſſus Mammiformis* is very ſmall. for the other Parts of the Ear, there no remarkable Difference between the *See* Plate XV. Fig. I, II, *and* III.

8thly, *The* Officula, *and the* Labyrinth *are of pretty nigh the ſame Size, in the* Adult, *and in the* Fœtus.

We ſhall here take notice, that the ſmall Bones of the Ear, the Semi-circular Canals, and the *Cochlea* are of the ſame Form, and very near of the ſame Size, in new-born Children, as they are in *Adults:* So that Age ſerves only to ſtrengthen and render them firmer.

The Trunk of the Portio Dura, *has two principal*

To finiſh this Deſcription, there remains nothing to be taken notice of, but ſome other Ramifications which the *Portio Dura* ſends forth. After it hath furniſh'd

Branc

anch which goes to the Ear, it pro- *Branches, which are divided into many Ramifications.*
eds about the Length of four or five
ines without any Diviſion; after this,
is divided into two conſiderable Bran-
es, the Superior of which is many
nes divided and reunited, as it aſcends
er the Maſſeter Muſcle, and croſſing
e Parotid Gland, at laſt forming a Fi-
re like a Gooſe's Foot, it is common- *The Ramifications of the firſt Branch, are diſtributed to the Muſcles of the Forehead, Temples, and Eyelids.*
ſubdivided into ſeven other Ramifica-
ons; the firſt five of which aſcend ob-
quely, and are diſtributed to the Muſ-
es of the Forehead, the Temples and
ye-lids. Some of theſe Ramifications
ing ſpread over the *Os Malæ*, paſs
rough particular *Foramina*, into the
rbit: The ſixth Branch paſſing over *And paſs into the* Orbit.
e middle of the Maſſeter Muſcle, re-
ives a conſiderable Branch from the
th Pair, which we ſhall afterwards de-
ribe; it furniſhes ſome Branches which
company the ſalivary Duct, and which
nbrace it in many places, and it is ſub-
ivided upon the Middle of the Cheek,
to a great Number of ſmall Filaments, *They alſo go to the Muſcles of the Noſe and Lips.*
hich are diſtributed to the Muſcles of
e Noſe, and upper Lip. The Seventh
deſtin'd for the Uſe of the Muſcles of
e lower Lip. Laſtly, many Ramifi-
cations

And to all Integuments of the Face.

cations of all these Branches, are lost the outward Integuments of the Face.

The Ramifications of the second Branch are distributed to the Muscles which are under the Jaw.

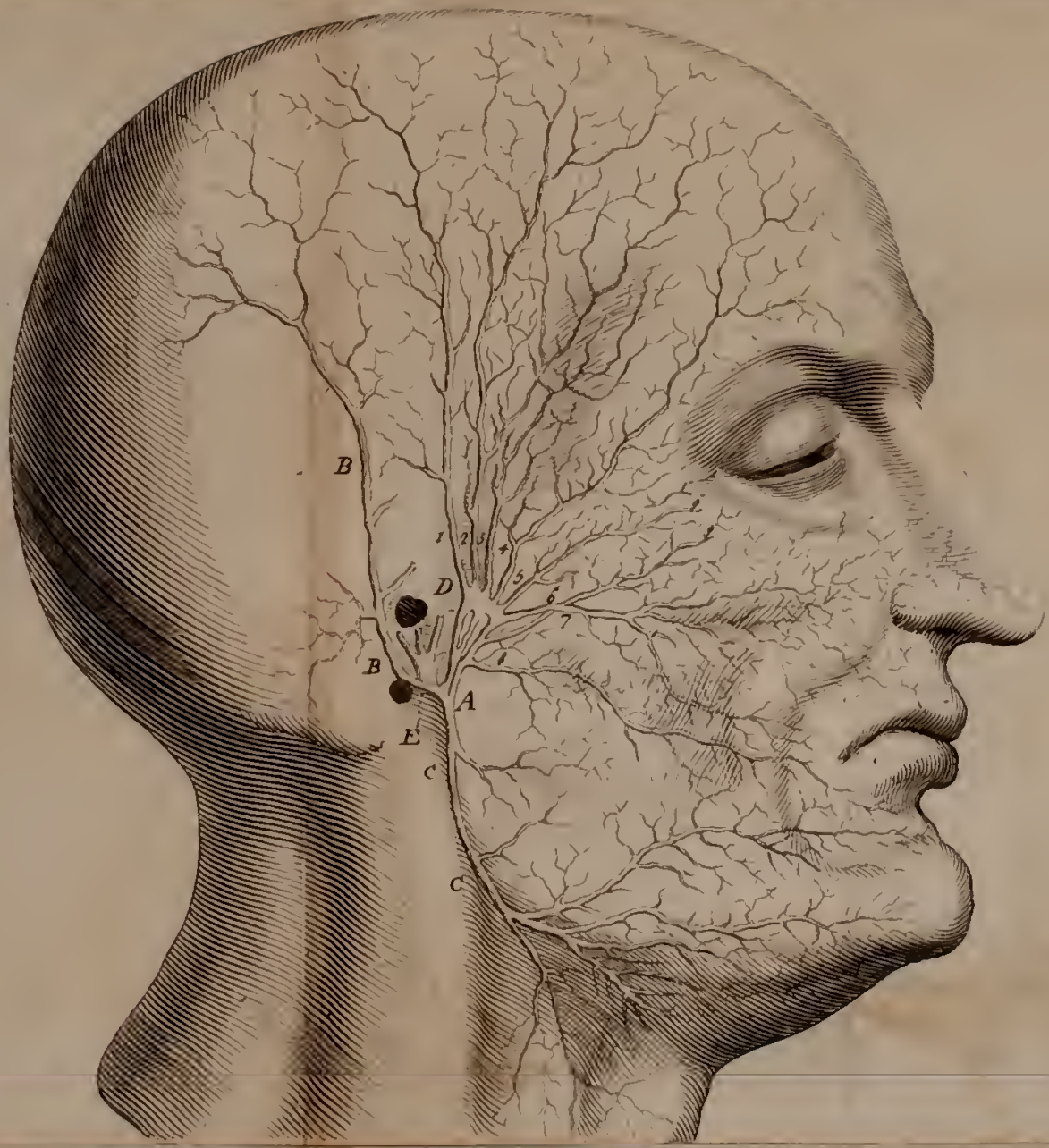
The inferior Branch proceeds dow wards under the Angle of the Jaw, a is divided into many little Twigs, whi are distributed to the Muscles that a cover'd by the Jaw. *See* Plate XV Fig. I.

Explanation of Plate XVI.

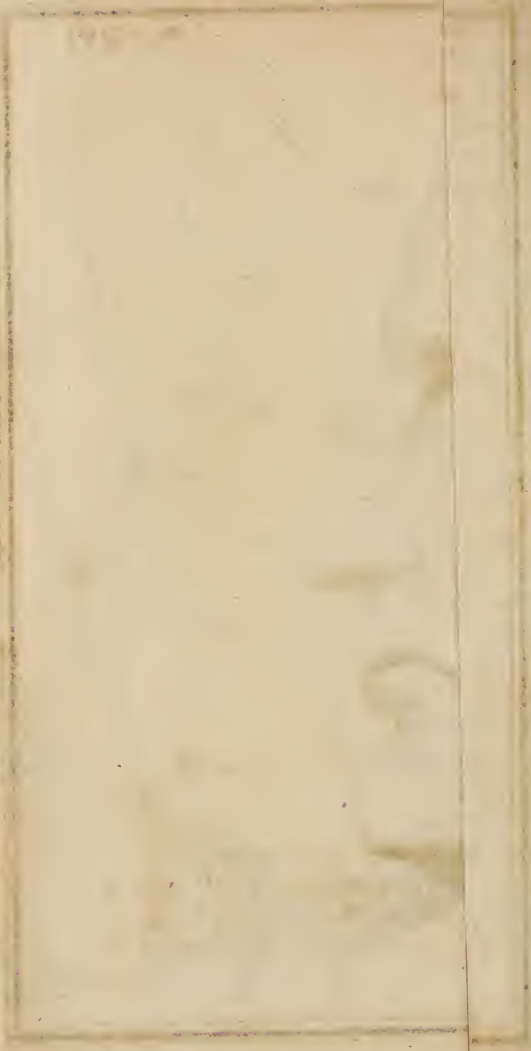
It represents the Portio Dura, *in t different Parts of the Face.* A, *the Tru of the* Portio Dura, *which proceeds out the* Cranium *thro' the* Foramen, *which between the* Processus Mammillaris *a* Styloides. B, B, *a large Ramificatio which it furnishes to the external Ear, so Branches of which are cut off, which a pear whole in* Fig. III. Plate XII. C, *the inferior Branch which is distributed the Chin, to the Muscles, which are situ ted under the Jaw, and to the Integumen* D, *the superior Branch, which immediat ly divides into the Shape of a Goose's Foo* 1, 2, 3, 4, 5, *five Ramifications of th Division, which are distributed to the Mu cles of the Temples, Forehead, and Eyelid* 6, *the Ramification of this Division, whi expands it self over the Middle of the Cheek*

an

Plate XVI.



B. Cole Sculp



which is enlarg'd by the Branch of the Pair, mark'd 7, 8, *the laſt Ramification of this Diviſion, which furniſhes Fibres to the* Muſculus Buccinator, *and to the Lips.* 9, 9, *two ſmall Filaments, which appear as if they were cut off, becauſe they ſink into the* Orbit *thro' particular* Foramina, *which are in the* Os Malæ. *All theſe Ramifications furniſh a very great Number of Filaments to all the Integuments of the Face, we muſt ſuppoſe them cut off in taking off the Integuments.* E, *the Branch of the fifth Pair, mark'd* G *in the Plate* XIII, *from whence a ſmall Branch. paſſes out, which is united to the Ramification,* 6, *of the* Portio Dura. *The other Branches being cut off, which are diſtributed to the external Ear, and to its Paſſage, may be ſeen in the ſame Plate,* i. e. *the* XIII.

The fifth Pair furniſhes a Branch to the Portio Dura.

One of the Ramifications from the Trunk of the fifth Pair call'd the *Maxillary*, immediately at its Egreſs out of the *Cranium*, ſends off many Branches, one of which paſſing under the *Proceſſus Condyloides* of the Jaw, advances forwards, and finding above the Jaw, very nigh the Neck of its Articulation, ſends forth a Filament, which paſſes over the Maſſeter Muſcle, and is united to that Branch of the

the

the *Portio Dura*, which ſpreads it ſelf ver the middle of the Cheek. All t reſt of this Branch is divided into ma Ramifications, which are diſtributed the cartilaginous Paſſage, to the E and to the parotid Gland. Sometin this Communication is made by a dou Branch. Mr. *Willis* and all the mod Anatomiſts after him, have advanc'd t the eighth Pair furniſhes a Branch, wh is join'd to the Trunk of the *Portio Du* at its Egreſs out of its *Foramen*: I h examin'd many Subjects in hopes of fi ing this Branch, but never could m with it; and I can ſcarce believe M *Willis* has ever ſeen it but in Brutes, wh this Communication is always to found, and is form'd before the *Po Dura* proceeds out of its Canal.

End of the Firſt Part.

OF THE

ORGAN

OF

HEARING.

PART II.

Containing the Use of the Parts of the Ear.

AFTER having given a pretty exact Description of all the Parts of the Ear, to render this Treatise more useful, I thought my self obliged to accompany it with some Reflections, and to draw from the Mechanism

The Mechanical Structure of the Organs of Hearing, serve to discover the Use of them.

nism of these Parts, some Consequenc
by which we may be able to explain the
Use, and the Manner by which we a
made sensible of different Sounds a
Noises. As it is a very important Su
ject, and appear'd to me to be very ni
and difficult, I wou'd not trust entire
to my own Judgment, and I confess th
I am oblig'd to Mr. *Mariote* for a gre
Part of what will here be found curiou
nevertheless, I must not expect that wh
I am going to treat of, will be well r
ceiv'd by every body. My Conjectur
appear probable to me, but other Pe
ple may be of a different Opinion. Ho
ever it happens, I shall think I have su
ceeded very well; if by this Essay I m
induce them to give us something bett

The external Ear performs the Office of the Trumpet, which deaf People make use of.

I shall follow the same Order that I c
in my Description, and therefore I co
sider the external Ear as a natural Trur
pet, whose neat and smooth Cavity serv
to amass the Sound, and consequent
renders its Impression stronger upon t
other Organs of Hearing. Experien
favours this Opinion, in that, those Pe
ple who have their Ears cut off, car
hear so well, and are oblig'd to mal
Use of the Palm of their Hand, or of
speaking Trumpet to supply this Defec

ar

also for this Reason, Brutes, as Deer and Hares, always turn their Ears that way from which the Noise comes, that they may hear the better. Some say that the directions of Sound, insinuating themselves into the Folds of the Ear, there form many Refractions before they come to the *Concha*, and that these repeated Refractions serve to increase the Impression upon the other Organs; as it happens in a Semi-circular Vault, that the Rays of the Sound being refracted equal Angles, the Length of the Circumference of the Vault, at last pass from one end to the other, by many great and small Refractions.

Its Folds serve to augment the Force of the Air, which acts upon the Organs by the Refractions which they cause.

The Motion of the Muscles of the external Ear, is very obscure; but they seem to be design'd for the Contraction and Dilatation of the *Concha*, according to the Force or Weakness of the Undulations of the Air.

The Muscles of the external Ear, serve to contract and to dilate it.

The Obliqueness of the auditory Passage serves not only to defend the *Membrana Tympani* from the Injuries of the Air, but also this Obliquity affords a larger Surface to the Passage, and is the Cause that there are more Refractions made there, and this may contribute to render the Impression stronger.

The Obliquity of the Passage, is proper to preserve the Membrana Tympani *from the Injuries of the Weather. And to render the Vibrations stronger, by doubling its Refractions.*

The

The Wax stops extraneous Bodies, which might impair the Membrana Tympani.

The Wax, or sort of Glue, which found in the anterior and cartilagin Part of the auditory Passage, stops Filth and Insects which else might en into the Ear, and which wou'd be a Cause of impairing the *Membrana T pani*. But if this Wax has its Uses, has also its Inconveniencies, so that if don't take care to clean our Ears, this g tinous Matter will be amass'd in it too great a Quantity, and growing th by its Detention, will at last be a me of obstructing the Undulations of Air from coming to the *Membr Tympani*. It is not long since, that sear ing out the Cause of Deafness in a Pers who had been afflicted with it m Years before his Death, I found in auditory Passage, about two Lines fr the *Membrana Tympani*, a small Pel which was soft and pretty thick wit considerable Quantity of Filth indurat collected before it, and I don't do but that this sort of Deafness is v common.

It may also be prejudicial to the Ear, when it is too thick, and in too great a Quantity.

We have taken Notice, that the tilaginous Passage which is broke of many Places, forms a sort of a li Tongue, which is at the Extremity the Cheek before the *Concha*, and dir

the Entrance into the auditory Paſ-
. This little Tongue hinders the
actions which are made in the Inſide
he *Concha*, from eſcaping out of this
ty, making them paſs more exactly
the Inſide of the auditory Paſſage:
ems alſo to be of Uſe in ſtopping up
Ear upon which it is plac'd, and con-
ently hindering the Impreſſion of the
upon theſe Parts, as the Eyelid be-
hut, hinders it from coming to the

'e have already ſaid, there are three
ifications of three different Pair of
ves, which are diſtributed upon the
laginous Part of the auditory Paſſage,
h occaſion that extreme Senſibility,
h is found in this Part, by which the
nal is advertis'd of the leaſt extrane-
Body, which might inſinuate it ſelf
the auditory Paſſage.

his will ſuffice for what concerns the nal Ear; the *Membrana Tympani* is irſt Part which preſents it ſelf to in the internal Ear, and although it be ſaid not to be abſolutely neceſſary earing, ſince ſome that are deaf, ta- hold of the Handle of an Inſtrument eir Teeth, can hear the Sound of t is nevertheleſs of ſo great a Conſe-

The Membrana Tympani *is neceſſary for the Preſervation of the other Organs.*

† quence,

quence, that if we lacerate or pierce through in any Animal, they may hear lerably well for some time; but th Hearing will grow insensibly weaker, a they will entirely lose it at last.

It is extended and relax'd by the Muscles of the Malleus.

This Membrane is extended and rela by the little Muscles belonging to *Malleus*, which is join'd to the back P of this Membrane: the external Mus relaxes it, and forms it into a plain perficies; the internal Muscle which situated upon the Surface of the *Os trosum*, draws it inwards, and conseque ly extends it more than it is in its natu State. Now the Tension of the *Me brana Tympani* is form'd in such a m ner, that both the Muscles act togeth whereas in its relax'd State, the Act is perform'd by the external Muscle lone. The Reason of this is, because Insertion of the external Muscle, be opposite to it, is fix'd near the Hea the *Malleus*; whereas the other M cle is inserted on the other Side, a li lower towards the Handle. The Forc the Contraction of the internal Muscle increas'd by that of the External, so t these two Muscles draw the Extren of the Handle of the *Malleus* inwards, which the Tension of the *Membrana T*

i is chiefly attributed. The Figure plains this more clearly. *See* Plate VI. Fig. V.

t is certain then that these little Muscles t, and it is also evident at least of the o first, that one extends and the other xes the *Membrana Tympani*; but the Difficulty is to know on what Occasions y act, and what it is that causes them place this Membrane in those different itions in which it must necessarily be, receive the different Impressions of ise, and of different Sounds.

s it the Will that makes them act? *The Will is not the Cause of these Muscles acting;* ere is not the least Reason to suspect For in short, a Noise most commonly prises us without our being appriz'd of And it is my Opinion that the Obs themselves are the sole Motives, ch cause these Muscles to extend or x the *Membrana Tympani* on diffe- Occasions, according to their diffe- Impressions.

Therefore it is my Sentiment, that the *But the different Dispositions of the Objects.* mbrane of the *Tympanum* must be ously dispos'd for the receiving the ous Undulations of the Air, and that Reality it wou'd be impossible for it to smit them such as they are, if it was in some measure fitted to their Cha- r; and if on different Occasions, it did

not form it self, if I may use the Expressio into proper Tensions to represent the v rious Tones of the sonorous Bodies. V know that upon placing two Lutes up one Table; if upon playing upon o String, we wou'd make a String of the ther Lute move, we must of Necessi place it in Unison with that which we pl upon; either in the Octave, or some ther Accords; as the double Octave, the Fifth or the Fourth; otherwise it w indeed vibrate, but the Vibrations w be very weak, and never audible.

And according to the different Occasions which concur,

This being allow'd, we may with great deal of Probability advance, th since the Diversity of Noises and Soun depend upon the different Nature and v rious Pulsations of the sonorous Bodi that for example, the acute Tone pr ceeds from a Pulsation on a Body, wh Particles are dispos'd in such a manne that they are incapable of any but ve quick Vibrations, which they immedia ly communicate to the Air; that on t contrary the Grave Tone is produc'd a Pulsation on a Body so order'd, tha is capable of none but very slow Vibr tions: We may, I say, assert that t Membrane of the *Tympanum* confor in some manner to the different Disp sitio

The Membrana Tympani *is more or less relax'd.*

According to the Diversity of Sounds.

ons of the sonorous Bodies in its diffe- *Which it does*
e States of Tension and Relaxation; and, *in putting on*
ve may be allow'd the Expression, *their Charac-*
s on their Character; as for example, *ters.*
s extended for acute Tones, because
his State of Tension it is more capable
quick Vibrations, but on the contrary,
s relax'd for Grave Tones, because it
g thus relax'd, it is better dispos'd
slower Undulations; and lastly, it ri-
nd falls in a thousand different Ways,
the different Ideas of the different
ses and Sounds. I confess it is hard *By mechani-*
conceive how this is perform'd; they *cal Motions,*
mechanical Motions which are imper- *which are dif-*
tible, the Nature and Causes of which *ficult to ex-*
difficult to explain. *plain.*

The *Membrana Tympani* therefore re- *The Agita-*
es the various Undulations of the *tion of the*
, and communicates them afterwards *Membrana*
he other Parts of the internal Ear. It *Tympani is*
dry, thin and transparent Membrane, *communicated*
Structure renders it fit for that Use, *to the other*
if these Qualities happen to be im- *Organs of*
a'd, we need not be amaz'd if a *Hearing.*
ckness of Hearing thereupon ensues.

There is room to believe that the Air, *Not so much*
ch is found in the *Tympanum*, being a- *by the help of*
ted by the Pulsations on the *Mem-* *the Air which*
na Tympani, contributes partly at least *is inclos'd in*
ommunicate them to the immediate *the Cavities*
of the Ear,

Organ. But nevertheleſs there is no a
parent Reaſon to imagine that this ſm
Quantity of agitated Air, is capable
ſhaking the *Os Petroſum*, or rather t
Labyrinth which is contain'd in the
Petroſum ſtrong enough: So that we m
As by the Aſ- aſſert with great probability, that
ſiſtance of the Pulſations on the *Membrana Tympani*
little Bones. alſo communicated to the *Malleus*; wh
the *Malleus* communicates to the *Inc*
Which ſhake the *Incus* to the *Stapes*, whoſe Vibrat
the Labyrinth, ſhakes the *Os Petroſum* and the *Labyr*
and the Air *thus*, in the ſame manner as the Air wh
which is in- *cloſ'd in it.* is between two Lutes that are placed up
one Table, is incapable of communicati
entirely the Undulation of a String of
of them to that of the other: but
String that is ſtruck, muſt firſt ſhake
Wood of the Lute to which it is fix'
afterwards the Wood of the Lute m
ſhake the Table, the Table the W
of the ſecond Lute; and laſtly, the W
of this Lute the String which is fix'd
it, and which is in Uniſon with that
the other. And this is ſo true, tha
we take one of the Lutes off of the
ble, and hold it up in the Air, the
periment won't ſucceed.

The Nature, Mechaniſm, and Art
lation of theſe three little Bones ſeem
favour this Opinion; they are dry,

al hard, and consequently very capable o being agitated. The *Malleus* through t whole length of its Handle is fix'd t the *Membrana Tympani*, so that it is sy to imagine that this Membrane can't b agitated without communicating its A;itations to the *Malleus*, and so succes- ely to the other little Bones, since they a articulated together, and their Ar- ulation being without Cartilages, may ily facilitate this Communication of Vibrations from one to the other.

The Muscle of the Stapes, *serves to extend the Membrane which is fix'd to its* Basis.

t is very difficult to determine the Use the Muscle of the *Stapes*; we may sup- e that in drawing the *Basis* of the *pes* a little outwards, which is imme- tely situated upon the *Fenestra Ova-* it extends the little Membrane with ich the upper part of its *Basis* is co- 'd; and therefore as it extends it more less, it renders it also more or less dis- p;'d to receive the Vibrations of the *embrana Tympani*, and to communi- e them to the *Vestibulum*, and to the byrinth. We may also add, that in

And to extend the Stapes *itself.*

wing out the *Stapes*, which is also pretty cible, it extends it in some measure, and eps it in a firmer State, and consequent- disposes it in a better way, to receive Vibrations of the *Malleus* and *Incus*.

The Passage of the Processus Mammillaris *affords a Passage to the Air, when it is over-press'd in the* Tympanum.

I have already said, that at the Sides the *Tympanum* there are two Passages, o of which terminates at the Palate, a the other proceeds into the *Cavernulæ* the *Processus Mammillaris.* It seems be very likely, that when the *Membra Tympani* is drawn inwards, the Air whi is inclos'd in the *Tympanum* retires ir these two Passages, and that it returns to the *Tympanum*, when the *Membra Tympani* is relax'd, otherwise the Moti of this Membrane wou'd be very much tarded by the Elasticity and Resistance the Air, if it had no way to pass out of And there is the same Reason to belie that the return of this Air into the *Tym num*, favours the Reduction of the *Me brana Tympani* into its natural Disposit

The Aqueduct *serves to bring the Air from without to it.*

The Passage which goes from the l late to the Ear, furnishes the Air wh is necessary for the continual Renewing that of the *Tympanum:* And as the great Coldness of the external Air mi

And to renew that which is in the Tympanum.

be prejudicial to the internal Parts of Ear, therefore this same Air as it asce up the Length of the Cavity of the l strils, and during its whole Course as fa the *Tympanum*, receives such Modulati as are necessary and suited to the Struc of the Parts thro' which it is to pass,

w

w ıout loſing the ſtrength of Elaſticity w ch makes it capable of performing the U:s for which it was deſign'd; and there-fo: the Air which returns from the Lungs, ar which is mix'd with impure Vapours, d(s not ſo eaſily enter into this Canal, th Orifice of which is ſo plac'd at the *Fœdus* of the Mouth, that it oftener re-ce/es the Air from the Noſtrils, than th t which returns from the Lungs.

Almoſt every body believes that by th aſſiſtance of this Canal, ſome deaf P ople can hear the ſound of ſtring'd In-ſt ments, and that their Deafneſs pro-c ding from the *Membrana Tympani* its n being able to diſcharge its Offices, no o ly ſhou'd be ſurpriz'd, if the Vibra-ti ns of the external Air being commu-n ated to the *Tympanum*, that theſe ſort o People are capable of hearing the S und of an Inſtrument. Nevertheleſs, t make it appear that the Vibrations of th Air which come into the *Tympanum* b the help of this Canal, are not ſuffi-c nt to make theſe deaf People hear the S und of an Inſtrument, we muſt here t:e notice that they are oblig'd to hold th Handle with their Teeth, otherwiſe th y could not hear it at all, or at leaſt n: ſo perfect; now it is eaſy to imagine

And not to ſupply the Office of the Membrana Tympani.

that the Teeth being agitated, this Ag
tation is communicated to the maxillar
Bone, from thence to the *Os Temporal*
then to the little Bones of the Ear; an
what yet more ſtrengthens my Opinio
is, what I have ſaid concerning the U
which I have aſcrib'd to theſe laſt me
tion'd Bones: for even thoſe who are n
Deaf, hear better and more ſtrongly th
Sound of an Inſtrument, when they ho
its Handle with their Teeth, and ſt
their Ears. Beſides this, there are ſon
deaf People, who hear much better wh
we talk with them over their Heads: a
in theſe we have Reaſon to believe th
the whole *Cranium* being ſhook, the
Petroſum and all the other Bones are al
ſhaken ſucceſſively.

The Feneſtra Ovalis *communicates the Vibrations of the Air to the Labyrinth.*

I have already remark'd that the *Fen*
ſtra Ovalis is exactly ſhut up by the Ba
of the *Stapes:* This little dry and fi
Bone, whoſe Baſis is very ſlender, and o
of whoſe Sides is cover'd with a Mer
brane, having receiv'd the Vibratio
from the two other Bones, and from t
Air contain'd in the *Tympanum*, m
very eaſily communicate them to t
Veſtibulum and to the Air contain'd ther
in, and afterwards to the *Cochlea*, a
to the three Semi-circular Canals.

Beſic

Besides this *Fenestra Ovalis*, there is another which is call'd *Rotunda*, which is put up by a Membrane pretty much like the *Membrana Tympani*; and we imagine that it receives the Vibrations from the Air contain'd in the *Tympanum*, and that it communicates them to that which is inclos'd in the *Scala Inferior* of the *Cochlea*; which being very much confin'd and pent up in this Place, where there is no Passage for its passing out, it is very capable of causing a strong Vibration in the *Lamina Spiralis*; and after this Manner, the Vibrations of the Air at last reach the immediate Organ of Hearing, which remains to be treated on.

The Fenestra Rotunda *communicates them to the* Scala Inferior *of the* Cochlea.

This Organ is comprehended under the Name of the Labyrinth, which being inclos'd in the *Os Petrosum*, consists of two principal Parts, *viz.* the *Cochlea*, and the *Vestibulum*, with its three Semicircular Canals.

The immediate Organ consists of two Parts which compose the Labyrinth.

As for the *Cochlea*, no body need doubt of its forming Part of the immediate Organ. Its Composition is a convincing Proof; for first the *Lamina Spiralis*, which is the principal Part of it, is hard, bony, slender and brittle, which are the Conditions requisite to render Bodies capable of being vibrated. Secondly, This

The first of which is the Cochlea.

The Lamina Spiralis *is easily vibrated.*

1. *Because of its Substance.*

2. Because it is very much extended.

Lamina does not lie upon the Inside the Semi-oval Spiral Canal, but is extended, joining on one Side to the Axis on the other, to a very fine Membra which is connected to the Surface of th Canal: so that this Situation of the *L mina Spiralis*, is very favourable to t Disposition it must have to be easily brated. Thirdly, The *Lamina Spira* by the means of the little Membra divides the whole Passage of the Spiral C nal as it were into Ranges of Stairs *Scalæ* in the *Cochlea*, built upon t same *Axis*, the upper one of which h no Communication with the lower. T *Fenestra Rotunda* opens into the low one, which has no Communication w the *Scala Superior* of this Canal, whic have before taken notice of, nor with t *Vestibulum:* So that the Air which is clos'd in the *Scala Inferior*, is agitated much by the Vibrations of the *Fenest Rotunda*, as by those of the Air in t *Scala Superior* of the Semi-oval Can which is also as much shaken by the l pulses of the Air contain'd in the *Vestib lum* with which it has a Communicati as by those of the Air inclos'd in the *Sc Inferior* of this Canal; the *Lamina Spi lis* being agitated on both sides, its bratic

3dly. Because in dividing the Semi-Oval Canal into two Scalæ, it receives Pulsations from the upper and the under one.

rations must be more lively and strong.

Fourthly, The Spiral Figure of this *Lamina* is moreover a very powerful Argument to sustain what I assert; for as it makes two Turns and a half round the *Axis*, it receives the different Vibrations of the Air in many Places, and this Mechanism is also observ'd in the Tongue and in the Nose, *&c.* Fifthly, A considerable Branch of the *Portio Mollis* of the auditory Nerve, after it is come to the Basis of the *Cochlea*, divides it self into many small Ramifications, which passing through all the little Perforations in the *Axis*, are distributed and lost in the different Windings of this spiral *Lamina*. In short, this *Lamina* is not only capable of receiving the Vibrations of the Air, but its structure makes it appear credible, that it is sufficient to answer to all their different Characters: For it being larger at the beginning of its first Convolution than it is at the Extremity of the last, where it finishes as in a point, and its other Parts diminishing in proportion in Bulk, we may suppose that the larger Parts may be vibrated without the others participating of that Vibration; and therefore they are capable of receiving none but the slower Undulations, which consequently answer

4thly. Because its spiral Figure is the cause of its being vibrated in many Places.

5thly. This Lamina *receives all the different Vibrations of the Air, because of its unequal Figure.*

to grave Tones: And that, on the contrary, its narrower Parts being agitated, their Undulations are quicker, and consequently answer to acute Tones. In the same manner that the larger Parts of a steel Spring form the slowest Undulations, and answer to grave Tones: And so its narrower Parts form quicker and more frequent Vibrations, and consequently answer to acute Tones. So that in short the Spirits of the Nerve, which expanded over its Substance, receive different Impressions which represent in the Brain the different Appearances of Tones according to the different Vibrations of the *Lamina Spiralis*.

The second Part of the immediate Organs comprehends the Vestibulum *and the three Semi-circular Canals.*

As for the *Vestibulum* and the three Semi-circular Canals, although some say that they are only subservient in increasing the Impressions of the Vibrations of the Air, others affirm that they deaden them; it is my Opinion that they form Part of the immediate Organ, for the following Reasons.

In the first place, all Birds have but three Passages which are curv'd in a Semi-circle, and a fourth which is straight and clos'd up at one End, but which opens with the others in a Cavity common to them all, and which supplies the Place of a *Vestibulum*. These three Canals

ai alſo found in Fiſhes; there is no *Cochlea* in neither of them, nevertheleſs they hear: it is therefore certain, that theſe Semi-circular Canals are the immediate Organ of Hearing in Birds and in Fiſhes. Why then ſhould they not have the ſame Uſe in Man, ſince their Structure is the ſame in Man as in theſe Animals? From hence at leaſt it neceſſarily follows, that theſe Semi-circular Canals form part of the immediate Organ in Man, and that therefore this Organ is compos'd of two eſſential Parts.

The Cochlea *is not to be found either in Birds or in Fiſhes.*

The Semi-circular Canals alone perform the Office of the immediate Organ in theſe Animals.

Secondly, No body diſputes the Communication of the Impreſſion of Sounds to the Brain being perform'd by the *Portio Mollis:* now this *Portio Mollis* has two Ramifications which enter the Cavity of the *Veſtibulum*; and which unfold themſelves and are extended into Filaments and Membranes, which line theſe Semi-circular Canals internally; from hence I conclude, that this Part of the Labyrinth forms alſo part of the immediate Organ.

There are Nerves and Membranes which are the cauſe of theſe Semi-circular Canals, forming part of the immediate Organ.

Thirdly, The Structure of the *Veſtibulum*, and of theſe Semi-circular Canals is ſuch, that we may very reaſonably imagine that the Impreſſion of Sounds is increas'd and ſtrengthen'd in theſe convoluted Paths, and that it muſt conſequently

Their Windings ſerve to augment the Force of the Air, by the Refractions which they cauſe.

ly become more capable of causing Vibration on the Nerves which are distributed there.

These Canals receive the different Characters of Tones as well as the Lamina Spiralis.

But as I have already said, that the *Lamina Spiralis* does not barely receive the Vibrations of the Air, and that all its Parts are not indifferently capable of answering to the same Tones; I also assert as much of these three Semi-circular Canals. Every one of these Canals is in the form of two Trumpets, which have their narrower Ends plac'd one within the other; that is to say, that the two Orifices of these Canals are larger in the Cavity of the *Vestibulum*, like the broad Ends of two Trumpets; and that the Middle of these Canals, which I look upon as the Place where the two Trumpets meet is narrower in Proportion: There are two of these Canals which have their Orifice into the *Vestibulum* common to them both, which together form a very large End in comparison to the other. Now it is demonstrated by Experience that the greater Circles of the broad Ends of Trumpets may be agitated without the lesser being sensibly affected: That the Vibrations of the great Circles are slower and more distinct, and that on these Occasions the Sound of the Trumpet is grave

give; whereas when the small Circles of the same Ends of the Trumpets are agitated without the great being sensible of it, the Sound of the Trumpet is then acute, because the Vibrations of these small Circles are quicker and more frequent. We may assert the same of the Semi-circular Canals; their larger parts may be agitated without the others being so, then the Vibrations of these fine Parts will be slow; from whence will necessarily follow the Appearance of a grave Tone: *& vice versâ*, when the narrower Parts are agitated without the others being so, the Appearance of an acute Tone will of necessity follow, because the Vibrations of these small Parts are quicker. From all that I have said, we may conclude that the *Cochlea* and Semi-circular Canals, are the common and immediate Organs, which not only receive the Undulations of the Air in general, but also which receive the true Idea, and the different Characters of Tones, according to the different Places of those Parts which are agitated.

Because they are made like Trumpets.

It may be objected, that these Semi-circular Canals are too much continu'd, and too much fix'd to part of the *Os Petrosum*, to be easily agitated in their different

And their Substance is very easily vibrated.

different Parts, and in so many differe ways. But besides that no body c make any considerable Noise witho the *Os Petrosum* being agitated, it certain that when we prepare these Ci cles to shew 'em plainly by themselv we take notice that they are surround with nothing but a spongy Substanc It is true, that in old Heads the bo *Laminæ* which cover these Circles befo and behind, are pretty hard; but th which fills up the Space which is rou these Circles, is of a more porous N ture: therefore they are always disengag enough, and very capable of being ag tated, and of Reverberating.

It is by the Communication of the auditory Nerves with those of the Voice,

That the Sympathy between the Voice and the Hearing is caus'd.

By the Communication of the *Por Dura* of the auditory Nerve, with t Ramifications of the fifth Pair which a distributed to the Parts, which serve form and to modulate the Voice, t Communication which there is betwe the Hearing and Speech is common explain'd. Some say that the Vibrati of the Nerves of the Ear, being comm nicated to the Nerves of the fifth Pai causes the Spirits which flow from t Brain into these Nerves, which proce to the Parts which form the Voice, dispose the Muscles in such a manne th

tht answering the Impreſſion which the Vice hath made in the Brain, they are p: in a Method of forming a Voice quite lie it. And this Reaſon is alledg'd for Men and Birds exciting one another to ſig, and for thoſe Men who are born dif, being alſo conſequently dumb.

It is alſo ſaid, that it is by the Communication of the ſecond vertebral Pair with the external Ear, that at the leaſt Noiſe it is cuſtomary to turn one's Head: And all the Body is diſpos'd to make different Motions, according as the Cauſes of the Noiſe are beneficial or hurtful. And as theſe Nerves communicate with thoſe of the Heart and the Lungs, it is from hence that we feel the ſame Alterations in the Pulſe and in Reſpiration, according to the Difference of the Noiſes. But every one does not agree in the Effects of theſe Communications.

And by the Communication of the ſecond vertebral Pair.

That the Affinity that there is between the Tones of Hearing, and the Motions of the Body is produc'd.

And that of the Pulſe.

End of the Second Part.

OF

OF THE

ORGAN

OF

HEARING.

PART III.

Containing the Diſorders of t Organ of Hearing.

The Knowledge of the Diſtempers of the Ear, depends upon that of its Parts which are affected.

AFTER having explain the Structure and Uſes the Organ of Hearing, finiſh this Subject, there r mains nothing elſe for n to deſcribe, but the Diſtempers of t

E

Er. My Design is not to trace them
m their Origin, but only as they relate
the Structure of this Organ; to make
appear how advantageous the Know-
ge of the Parts is to the Explication of
: Diseases. I shall not confine my self
the Divisions which Authors common-
make; but shall here follow, as I have
ne in my Explanation of the Use of the
rts, the Order of my Description:
t is to say, I shall first examine what
stempers happen to the external Parts,
erwards those which attack the *Mem-
ana Tympani*, the *Tympanum* and *La-
rinthus*; and lastly, those which belong
the auditory Nerve. After which I shall
plain the Noise or Tinckling, which is
symptom common to the Disorders of
. these Parts; and I shall not ground
y Reasons but upon Observations taken
om very creditable Authors, and upon
ose which I have had an Opportunity of
aking my self, when I was working
on the Ear.

The Disorders of the auditory Passage, which cause extreme Pain and remain in this Part, proceed from

The most common Symptom of the
xternal Parts of the Ear, is Pain; it
ommonly infests the *Concha*, and the
hole auditory Passage as far as the *Mem-
rana Tympani*. Experience teaches us
at it is accompany'd with Pricking,
Erosion,

Eroſion, Tenſion, Weight and Pu
tion.

I ſhall not in this place explain
Nature of Pain in general, but ſhall t
of it more largely when I come to
Organ of Feeling. Now here it will
The Solution of Continuity. ſufficient to know that Pain is caus'd
a Solution of Continuity of Partic
which when they are united, form
firſt Conſtitution of the Parts of Anir
Bodies: This Solution of Continu
cauſes an irregular Motion in the Spir
and in theſe two Things the former R
ſon of Pain conſiſts.

This being allow'd, we may eal
know that whatſoever can cauſe a Sc
tion of Continuity in the Particles of
Membrane, which lines the audit
Paſſage, and excite this irregular M
tion of the Spirits, is capable of pro
cing Pain. Thus an Inflammation,
traneous Bodies in the paſſage, Worr
and in a word, all that can cauſe Pain
other Parts, may be applicable to t
here. But beſides this, the Ancie
have maintain'd that the Pains in the E
may happen without an Inflammatic
and without any conjunct Cauſe; fr
whence they have explain'd theſe Pa
by Intemperies alone without Matt
whi

ich they commonly believ'd to pro-
d from Excefs of Cold or Heat: but
theſe Intemperies without Matter are
aginary, and as we may find in the
rt, Things capable of producing this
lent Pain, I will lay down my Senti-
nts of it in few Words.

I take notice, that the Wax which is a- *Caus'd by the Wax, which is in the Inside of the auditory Paſſage.*
nſs'd in the Ear is bitter and viſcous,
d that conſequenlty it abounds with
id and lixivious Salts, which are mix'd
th thick and oleaginous Particles; theſe
inciples give it very nigh the Qualities
ich are attributed to the Bile, which
very much reſembles. If it happens
any Means whatſoever, that theſe
ine Juices diſengage and expand
emſelves, and that being more exalted
an uſual, their Points act with more
olence; it is evident that they muſt
uſe great Diſorders in the auditory
ſſage, becauſe of its extreme Senſibili-
. Cold and Heat are moſt commonly
e Cauſes of it. For Cold thickening *The external Cold increaſes the Acrimony of it;*
is Wax, and rendering it more viſcous,
uſes it to obſtruct and ſtop up the ex-
etory Ducts of the Glands, as it may be *By the Obſtruction of the excretory Ducts of the Glands.*
bſerv'd in the other neighbouring glan-
ular Parts, in which this Action of the
ir cauſes the like Obſtructions: from
whence

whence it follows, that the ſaline Juic which were in motion, and in a Diſpo tion to paſs out, being obſtructed in t Glands, puff up and ſwell them; a becoming more acrimonious by their b ing detain'd, prick upon the Extremit of the Nerves, with which the audito Paſſage is ſtor'd; and are the Cauſe of very great Diſorder in the Spirits, a conſequently of that great Pain of t Ear. On the other hand, the exterr Heat looſens and diſſolves the ſali Juices of this Wax, and produces by tl Means the ſame Effect. The ſame Thi is obſervable in the Pains, which a caus'd by the Bile in the alimenta Parts, by the exceſſive Degrees of He or Cold.

Which renders the ſaline Juices more pungent.

By Heat, which looſens and diſſolves theſe ſaline Juices.

But the Ear-Wax is not the only Cat of theſe acute and violent Pains; it ve often happens that thoſe ſharp, ſalir ſerous Humours, which are evacuated t the Glands of the Ear, cauſe Pain in t auditory Paſſage, which is apparent the Suppurations of this Part: For theſe ſerous Humours which are emitte are ſometimes Acrimonious or Salir they ſtimulate the Membrane of the Pa ſage, and excite an uneaſy Senſatio which is what we call Pain.

Or by the ſharp ſaline and ſerous Humours, which ſometimes come out of the Glands of the Ear.

As for the different Senſations of Pain, I believe they may be accounted for in this Manner: When the ſaline Particles of Wax, or even the other Humours contain'd in the Subſtance of the Glands, at become pointed and hard, and by being more ſtrongly agitated than uſual, they ſtrike violently upon the nervous Filaments of this Paſſage, and produce a pungent Pain, which happens in all Inflammations, and eſpecially in Perſons of a dry and bilious Habit of Body, whoſe Humours are fill'd with thoſe acrid and ſaline Juices: and in People of a melancholic Habit, in whom the ſerous Part of the Blood is always ſharp or ſalt; when theſe Salts become very acrimonious or very corroſive, they cauſe Pain accompany'd with Eroſion, which is chiefly to be taken notice of in Ulcers of this Part. When the Subſtance of the Wax which is ſtill contain'd in the Glands, is fermented alone or with other Fluids, it extends or dilates the Particles of the Membrane, and cauſes a Senſation of Tenſion. When the Glands are ſwell'd with the abundance of the Fluid with which they are fill'd, they leave a Senſation of Weight: As for that ſort of Pain which is accompanied with Pulſation, I believe

The different Solutions of Continuity, cauſe the different Senſations.

Of pungent Pain.

Of Eroſion.

Of Tenſion.

Of Weight.

Of Pulſation.

believe it never happens to the audi Paſſage, but when it is inflam'd.

This Pain is very violent, becauſe

There is nothing ſo ſurprizing as Violence of this Pain; it is hardly without an acute Fever, which is att ed with Wakings, Delirioufneſs, (vulſions, and Swoonings; Sympt which are often the Cauſe of Death may be ſeen in Obſervations made by ny Authors: For the better underſt ing the Violence of this Pain, we muſt

The Membrane of the Paſſage is compos'd of a fine and nervous Texture.

ſerve, Firſt, That the Membrane, w lines the auditory Paſſage, is fine nervous, and compos'd of the ſame T ture as the nervous Membrane of the mach and Inteſtines, excepting its not ing indu'd with thoſe *Villi*, to preſer from the Acrimony of the Humc

And receives a great Number of Nerves.

2. It is cover'd with an infinite Num of Nerves, which it receives from the Pair, from the *Portio Dura* of the a tory Nerve, and from the ſecond ve bral Pair, as it has been deſcrib'd in firſt Part of this Treatiſe; and we aſſert, that there is no Membrane in whole Body, which has more Nerve

This fix'd cloſe upon the Bone.

proportion than this has. It is cer that thoſe Membranes which are f cloſe upon the Bones, have a more quiſite Senſation than the others, wh

y possibly proceed from their being re firm and more extended, and that ng connected to the Bones by all their ll Vessels which they send off to them; s impossible that these Vessels can be nulated, without all their small Rami- tions being agitated at the same time, for this Reason the *Periosteum* and *Pe- anium* have so exquisite a Sensation: in the same manner we may imagine the acutest Pains of the Head pro- d from the Adherence of the *Dura ter* to the Top of the *Cranium*, as as been observ'd. This is easily ap- able to the Membrane of the auditory sage, for this Passage is partly bony partly cartilaginous, and the Mem- ne is extended upon the Cartilage, gh not quite so much as it is upon Bone. Now it is remarkable that e Pains which infest the Bottom of Ear, which is the bony Canal, are ays the most violent. 4. The Con- on of this Membrane with the neigh- ring Parts, may greatly contribute to Acuteness of the Pain; for this Mem- ne is extended as far as the *Membrana pani*, which communicates with the Inbranes which line the *Tympanum*, with those of the Labyrinth; and

And connected with other very sensible Membranes.

by their means with the *Dura Mate*
After, need we be aſtoniſh'd if the Pai
in the Paſſage are ſo ſharp and violent

Although the greateſt Part of t
Symptoms which accompany the P
of the Paſſage, may be met with in t
Pains of other Parts, nevertheleſs as th
Symptoms are more frequent and m
violent in this Part, I judg'd it neceſſ
to explain them.

When this Pain is caus'd by an Infla
mation, there is no Difficulty in giv
a Reaſon for the Fever, and the ot
Symptoms which commonly attend
But as I am convinc'd the Acuteneſ
the Pain alone may cauſe all theſe Syr
toms without either Inflammation or
mour, I ſhall apply myſelf chiefly
this laſt Caſe.

And this often cauſes an acute Fever,

I begin with the violent Fever, wh
almoſt always accompanies the Pai
the Ear; and I take this to proceed f

By the Agitation of the Spirits.

the Spirits being agitated by the
lence of the Pain, which encreaſe the
tion of the Heart and of the Arte
which is the Cauſe of the Quickne
the Pulſe and of the Increaſe of H
as is viſible in ſome Paſſions, and p
cularly in that of Anger. But this
mentation of the Motion of the H

ad Blood, does not produce a real Fe-
v· without it disorders the Principles of
th Blood. Now it is easy to conceive,
t.t by these strong Contractions of the
Heart, the Parts of the Blood being
nore exactly broken and divided, an
Exaltation of its most active Particles
is·aus'd, and its oily Part is more per-
fctly dissolv'd, whose swift and rapid
Motion is the Cause of Heat in the Fe-
v·. Moreover, the acrimonious and cor-
rive Juices of the Wax, and of the se-
rous Humours which are amass'd in the
Ear, may re-enter and mix with the
Mass of the Blood, and there cause an
extraordinary Fermentation, in which
the Essence of a Fever consists. We
shall easily comprehend this sort of Fe-
ver, if we consider that in Colds the
Fever springs from the Mixture of the
sharp Juices, which separating from the
Mass which is the Cause of the Continu-
ance of the Cold, mix with the Blood.

And by the Fermentation of the Blood.

The Watchfulness, or Inability of
Sleep, depends upon the extraordinary
Agitation of the Spirits; which finding
themselves continually irritated by the
Violence of the Pain, flow continuallly
into the Parts, and maintain them in their
Functions.

Watchfulness.

The Delirium. The Deliriousneſs differs in noth from the Watchfulneſs, but that in the Spirits moving irregularly in Brain, they touch at the ſame time ma Traces of the Memory and Imaginati which cauſe a Confuſion in the *Ide* that theſe ſame Spirits repreſent to Soul.

Convulſions, The Convulſions are eaſily explai in this *Hypotheſis*; for the involunt Contractions of the Muſcles being cau by the irregular Motion of the Spir it is ſufficient that the ſaline Juices mulate the Nerves, which are interſpe ed in the Membrane of this Paſſage, cauſe that Irritation to be communica to all the Spirits, by the Communicat of the Nerves and Membranes, and terwards to cauſe Convulſions in the M cles. Beſides, it may happen that th ſharp Juices re-enter the Blood, and ing carried to the Brain, cauſe Irri tions in that Origin of the Nerves.

And Swooning. To give a Reaſon for the Swooni we muſt conſider, that the Spirits flo ing ſwiftly, and in great abundance to the Muſcular Fibres, which contr and ſhut up the Orifices of the Hea they ſtop the Motion of the Blood; when this Contraction ceaſes, and

Blo

Blood enters afresh into the Heart, the Pulse and the Heat are renew'd: The Oppression of the Heart and Weight in the Breast, which are felt in this State, are pretty sure Indications of the Swooning proceeding from the Cause which we have just describ'd; and this Oppression of the Heart may continue so long, as sometimes to be the Occasion of Death.

For an Example of a great Pain in the Ear, accompanied with violent Symptoms, I shall content myself with only giving you the fourth Observation of the first Century from *Fabricius Hildanus*, because it includes all the principal Symptoms. A young Girl twelve Years old, having by chance let a Glass-Ball enter into the Hole of her left Ear, which could by no means be extracted, was seized with acute Pains, which were communicated to the same Side of the Head: These Pains, after a long space of Time, did produce a Numbness in the Arm and Hand, afterwards in the Thigh and Leg, and at last in all the left Side. This Numbness was accompanied with very great Pains, which encreas'd in the Night, and in cold and wet Weather with an Irregularity in her *Menses*, with Epileptic

History upon this Subject.

Fits, and with an Emaciation of her l
Arm. *Fabricius Hildanus* eight Years
ter extracted the Glaſs-Ball, and th
all the Symptoms ceaſed, to which
the other Remedies which were us'd
ſo long a time, could not give the le
Eaſe.

Remarks upon this Hiſtory. Many Remarks might be made up
this Obſervation; but as I have explai
the greateſt part of its Symptoms, I ſh
apply myſelf only to ſome which are p
ticular in this Caſe. The Pains and C
vulſions ſeiz'd on all her left Side to
end of her Foot. *Hildanus* has explai
this *Phænomenon*, by ſaying that
Portio Dura is diſtributed along the Ar
and to the Thigh: But as this Diſtri
tion is imaginary, I ſhall endeavour
give a Reaſon more ſuitable to the Pa
I therefore think that the Irritations
irregular Motion of the Spirits, had
into all the Nerves of the *Medulla*
this ſide, by the Communication of
ſecond Vertebral Pair: This is w
would not have happen'd, if the Ir
tion had been communicated to the Br
for then there is Reaſon to imagine
this Girl would have ſuffer'd Pains
Convulſions in all Parts of her Bo
From whence I ſuppoſe the left Sid

e *Medulla* to be only affected: it is ea- to conceive how this Indiſpoſition ould paſs into the Arm and into the eg, ſince we know that all the verte- al Nerves of the ſame Side commu- icate with one another by tranſverſe amifications, after they have paſſed ut of the *Foramina* of the *Vertebræ*.

All the Symptoms increas'd in the ight and in wet weather, becauſe the umidity of the Air puffing up the lands and the Membranes of the Paſ- ge, made it more cloſely embrace the laſs-Ball, which increas'd the Irrita- ons.

The Numbneſs in all likelihood pro- eded from the irritated Spirits opening d dilating the Orifices of the Nerves, in ch a manner that they not only afforded Paſſage to the Spirits, but alſo to much oſſer Subſtances; which being forc'd o their Tubes, caus'd a ſort of an Ob- ruction in them, capable of hindering e Motion of the Spirits, which is ſuf- ient to cauſe a Numbneſs. Theſe Sub- nces becoming more acrimonious by eir Detention, increas'd the Pains and onvulſions; which being found more olent in the Arm, its Nerves imbibed ch a Quantity of theſe extraneous Sub-

ſtances, that the Motion of the Spir
was thereby interrupted, which was t
Reaſon of the Arms becoming emaciat
and wither'd, as it happens in Palſies.

After the Glaſs-Ball was extracted, t
Irritations which it caus'd ceas'd, a
conſequently the Pains and Convulſior
The Spirits recovering their comm
Courſe, inſenſibly diſſipated all the e
traneous Bodies, which caus'd the A
to regain its Motion and priſtine Vigo

Remedies to be us'd for the Pain caus'd

I now come to the Means which
to be us'd in the Cure of this Diſtemp
They muſt be different, becauſe of the I
verſity of the Cauſes which produce
As for the Pain, that which is produ
by Cold, is ſometimes cur'd by taking
way the external Cauſe; that is to ſay,
keeping it from the Cold and the Wi
and by applying upon the Ear, eve
thing that way warm it, as thick Wo
or hot Bread, which may alſo be ſteep'd
Spirits of Wine; but the Pain ſeldom yie
to theſe firſt Remedies, and then we m
be oblig'd to proceed to the general R
medies: Bleeding is neceſſary to h
der a Collection of thoſe Bodies, wh
the Cold has detain'd; and as
Purging, it is not to be order'd till
violence of the Pain is diminiſh'd. I
ri

ng their Uſe, Fomentations are very
ſucceſsfully employ'd, or Injections com-
os'd of the Juices or of the Decoctions of
aum, *Hyſſop*, *Calamint*, *Origany*, *Mar-*
ram, in which we may mix ſome Drops
Bullocks Gall, or rather ſome Drops
Oil of bitter *Almonds*, or *Camomile*,
oves, *Aniſeeds*, &c. Authors very much
commend the ſtopping the Ear with
otton perfum'd with Musk; there is no
ifficulty in explaining the Effect of
eſe Remedies, they are all endued with
very penetrating volatile Salt, which
arming theſe Parts, open the Pores,
d the Ducts of the Glands, and cauſe
e Subſtance to flow, which was before
tain'd by the Cold.

The Pain which proceeds from Heat, moſt commonly cur'd by general Remedies, eſpecially by Bleeding, which abſolutely neceſſary to hinder a Fluxion and an Inflammation, which might happen to the Part. During the Uſe of theſe Remedies, we may with great ſucceſs make uſe of Injections compos'd of Milk, that of a Woman is better than any other, when it is mix'd and beat up with the White of an Egg; beſides this, they make their Injections of ſome cooling and emollient Decoction, in which they

For the Pain proceeding from Heat.

drop some Oil of sweet Almonds;

Oil Yolk of an Egg is very much commended by *Devigo*. We may also apply some emollient and anodyne *Cataplasm* upon the Ear; and when the Pains are extremely violent, we must have recourse to *Narcotics*, which may be mix'd with topical Remedies, and likewise be given internally. All these Remedies are so well known, and so much us'd, that I shall not stop here to give you an account of their Operations.

For the Pain caus'd by serous Humours.

When the Pain is caus'd by sharp and salt serous Humours, the Water of *Carduus Benedictus*, or blessed Thistle, is used, in which, Woodlice, Earthworms, and Ants Eggs, *&c.* are boil'd: We may add a few Drops of Oil of Box. As the Medicines abound with an *alkalious* volatile Salt, they destroy the Acidity of the serous Humours, which were the Cause of the Pain.

The Causes which produce the Inflammation in the auditory Passage are,

The second Distemper that I shall take notice of incident to the auditory Passage is Inflammation with Abscess, and Ulcer, which commonly succeed it. An Inflammation proceeds from Wounds and Contusions of this Part, and may also be the Sequel of certain Fevers, as of the *Pleurisy*, *Quincy*, and of many others

the same nature. It very often happens that an Inflammation may be produc'd in the auditory Passage, in two different Ways. The first is from an Obstruction of the Glands, which pressing upon the Vessels, stop the Blood, and by that means are lacerated by it. The second is from the Acrimony of the Wax, which may lacerate these same Vessels, and by that means cause an Extravasation of the Blood. However it be, the Inflammation and Abscess which succeed it have nothing particular in them, but the violent Pain which I have already describ'd.

The Obstruction of the Glands.

The Acrimony of the Wax.

Which cause Abscesses,

The Ulcers of this Part are form'd in the same manner as Ulcers of other Parts, either from a Rupture of an Abscess, or by the Acrimony of some Fluid: I take notice that they commonly send forth a very large Quantity of Matter, and that they are very difficult to cure, especially those which are in the bony Part of the Passage. The Quantity of Matter proceeds not only from the Blood which is suppurated, but also from the Glands, which being always irritated by the *Pus*, pue forth a very large Quantity of Fluids through their excretory Ducts; and the Difficulty which is found in curing these

And Ulcers.

Which are very difficult to cure.

Ulcers, proceeds from their being constantly moisten'd by the Fluid, which comes from these Glands, so that they cannot be dry'd up : besides, the Matter which proceeds from these Glands, being sharp and saline, hinders the *Reunion* and the *Cicatrix*; the same thing happens in Ulcers of the Nose, of the salivary Ducts, *&c.* Ulcers in the bony Passage are more difficult to cure than those of the cartilaginous Passage, because the bony Passage runs down towards the *Membrana Tympani*, and makes a considerable Descent in the Place where it grows flat, which is the Cause that the *Pus* cannot pass out of it but with difficulty ; whereas the Descent of the cartilaginous Passage being towards the *Concha*, the *Pus* and other Humours are immediately evacuated, and don't remain here as they do in the other Passage.

We sometimes meet with Worms in the Passage.

It sometimes happens in old Ulcers of the Ear, that Worms of different Figure and Size come out with the *Pus*, as may be seen in the Observations made by *Forestus Schenkius*, and in the *German* Journals. I shall not stay here to examine whether these Worms are produced by the Corruption of Humours, or whether the Heat only of these Ulcers hath

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e Eggs, which thousands of Insects that / in the Air may possibly leave in this lace; I shall have an Opportunity of eating of it upon some other Occasion.

Besides the *Pus* which passes out of ie Ears in Ulcers, it is remark'd that almost all Children the Ears emit a reat Quantity of Humidity, and that isEvacuation is of very great use to 'em; herefore we take care not to stop it, or lse the Children wou'd fall into convulve and epileptic Fits, which has made been believ'd that this Fluid came from ie Brain as well as those clear and etid Humours which some People emit t their Ears: Nevertheless, it is cerain that there is no visible Ways by vhich any thing can come from the Brain into this Part: for there is but one *Foramen* in the *Os Petrosum*, which forms n impervious Passage at its Extremity on the Side of the Ear, and which is exctly stop'd up by the auditory Nerves; herefore it is scarcely credible, that any hing can come by that Way. But if even these watry Humours and Blood cou'd erode the Bottom of this *Foramen*, and so procure a Passage through this Place, these cou'd enter no where but into the *Vestibulum* and *Cochlea*, and must necessarily

The Cause of the Suppuration, and the Flux of Blood,

Which apparently does not come from the Brain.

neceſſarily erode the Membrane which cloſes up the *Feneſtra Rotunda*, the Baſis of the *Stapes*, and the Membrane that covers it, to paſs into the *Tympanum* at laſt, when they are come into the *Tympanum*, they certainly muſt rather fall into the Mouth through the Aqueduct, that lacerate the *Membrana Tympani*, to paſs through the auditory Paſſage. I do find this Difficulty in explaining theſe *Phænomena*; if Children emit a great Quantity of watry Humours through their Ears, it muſt be attributed to the Diſpoſition of their Blood, which is aqueous; and to the Relaxation of the Glands of the Ear, which is alſo found in the Glands of the neighbouring Parts. And if the Suppreſſion of this Evacuation cauſes them to fall into Convulſions and Epilepſies, it is eaſy to underſtand how this happens, becauſe theſe Juices being ſtopt, may become more acrimonious by their being retian'd, and cauſe Irritations on the Membrane of the Paſſage, and may even return into the Maſs of Blood, and afterwards be diſcharg'd on the Brain. As for thoſe Perſons who emit clear ſetic Water from this Paſſage, we muſt take notice, that although the Glands of the Ear are chiefly deſign'd in their natural

State

tate for the Secretion of the Wax, for ıe Uſes I have before ſpoke of; there no Obſtacle to hinder them from ſerv-ıg as an Outlet, for the Evacuation of ernicious Humours, which is plainly ɛen in all the conglomerate Glands: and ; for the Blood which in Wounds of ıe Head comes out of the Ears, we now that this proceeds from a Rupture f the Veſſels, which are interſpers'd up-n the Paſſage. It is eaſy to judge, by ıe violent Emotion, that all the *Cra-ium* ſuffers on this Occaſion, how a Lupture may be produc'd in this Part s well as in the Brain. Laſtly, I ſhall ive ſome Obſervations to prove that the uppurations which are made in the Ear, ave no manner of Communication with ıe Brain. A Man about ſixty five years ld, of a full and ſanguine Habit of Body, ad a very conſiderable Suppuration in his ars, and eſpecially in his Right, for five nd twenty Years together, although in ll other reſpects he enjoy'd a perfect Health. The Matter which he diſ-harg'd was fetid and very thick; he died f an Apoplexy in four and twenty Hours fter this Suppuration was ſtopt. I o-en'd the *Cranium*, and having carefully xamin'd all the Parts of the Brain near the

the *Os Petrosum*, I found them perfectly sound, and the Bone in its natural State and I actually met with serous Humour in the Ventricles and Cavities of the Brain, which were extremely different from the Matter which came from the Ears: I have open'd the Ears of many Children, whose *Tympanum* was full of Filth, yet I never found any bad Disposition either in the Brain, or in the *Os Petrosum*.

Cure of the Inflammation.

To cure the Inflammation of the auditory Passage, we must take the same Methods that are used in all Inflammations of the external Parts; that is to say first to stop the Fluxion by Bleedings and by those Remedies which are called *Anodyne*, which we have already mentioned in the Cure of the Pain; to which may be added, Oil of Roses, Oil of Water-Lillies, the Juice of Lettices, of Garden-Nightshade, *&c.* But if the Inflammation continues and tends to Suppuration we must make use of Suppuratives; such as the Cataplasms of Crumb of Bread, and those which are made of Onions, Lilly-Root, fresh Butter, and Oil of Chamomile or Melilot.

Abscess.

Ulcer.

When the Abscess is open'd, we must make use of detersive Injections, made with

wh Barley-Water and Honey of Roſes; a1 if there is a Neceſſity for ſtronger Emedies, we may uſe Decoctions of Agrimony and Birthwort, and other vul-nary Plants, in White-Wine, in which v muſt mix Honey of Roſes or Oxymel Squills; if the Ulcer is ſordid and pu-td, the Tincture of Aloes made with Spirits of Wine may be us'd, and the Green Balſam of *Mets*, if it is very deep.

After this Ulcer is deterg'd, we muſt cy it up, and cicatriſe it: for theſe In-tations, the Decoctions made of Plan-n, Birthwort, Gall-Nuts, *&c.* are ve-much eſteem'd. The *Grenada*-Wine, ſcrib'd by *Devigo*, is an admirable Me-cine. As theſe Medicines have no par-ular Quality in them, and as they are 'd in all ſorts of Inflammations and Ul-rs; I ſhall not here explain their Ope-tion: I ſhall only ſay this, that whilſt eſe are uſing, we muſt not neglect the eneral Remedies, which are a very great elp in the whole Courſe of theſe Diſ-ſes.

To deſtroy the Worms, we make uſe of *Worms.* itter Things to put into the Ear, as the uices of Wormwood, of little Centory, he Decoction of Coloquintida, or elſe a ew Drops of Oil of bitter Almonds, or of Oil

Oil of Box. The *Journal des Scavans* 1677, relates that Spirit of Wine is a infallible Remedy for Worms which a form'd in the Ears. Thoſe of theſe Me dicines, which are oily and thick, are ex cellent, becauſe they ſtop up the *Bron chiæ* of theſe Inſects, and ſuffocate ther in an Inſtant.

And Fluxes of ſerous Humours.

As for thoſe Fluxes of ſerous Matte which we have term'd Suppurations, a they are for the moſt part indolent, an cannot be ſtopt without cauſing pernici ous Effects, we ought not imprudentl to ſtop 'em: In thoſe that are painful we muſt have recourſe to the Remedie which have been already deſcrib'd, wher we treated of Pain.

The third Diſeaſe of the auditory Paſſage is Obſtruction; it is occaſion'd by Extraneous Bodies.

The third Diſeaſe of the auditory Paſ ſage is Obſtruction; it moſt commonly ſucceeds an Inflammation, Abſceſſes and Ulcers, which uſe to ſwell this Part. Be ſides this, it may happen from many other Cauſes. In the firſt place, from extra neous Bodies, which may be introduc'd into the Paſſage, ſuch as Peas, Shot, Nut, Kernels, *&c.* When they have been put a great way in, it is extremely difficult to extract them, becauſe they are inclos'd by the bony Paſſage, which is very oblique, and proceeds downwards towards the

Membrana

Membrana Tympani; besides their being drain'd by the viscous Wax, which is collected there, the greatest Difficulty is in taking out Peas, and those other Grains which swell in the Passage, and which may even bud there, as you may see in the Examples of *Fabricius Hildanus* and *Shenkius*.

2. The most frequent Cause of Obstruction in the Passage, is the Wax which is inspissated and retain'd in it: This Wax in those that don't take care to clean their Ears, is collected in a great quantity, and grows so thick by its Stay, that it entirely stops up the Passage. It may also be sometimes naturally very thick in People of a cold and pituitous Habit of Body, whose Humours are viscous, and the Cold of the external Air may very much contribute to this Effect. There is also great reason to suspect that this Wax may be petrified, and cause an incurable Deafness, which seems very likely from the Conformity there is betwixt it and the Bile, which is often petrified in the *Vesica Fellis*: and this may be confirm'd by the 45th Observation of *Bartholine*'s *Journals*, which relate, that his Wife having been a long time tormented with a Pain round her Ear,

2. The retain'd Wax.

Which petrifies sometimes.

Ear, discharg'd small Stones thro' the auditory Passage which came out with the Wax, after which the Pain was assuag'd: However, it happens this Wax is often found very thick in the form of Plaister, which exactly fills up the bony and cartilaginous Passage, which I have observ'd in more than ten or twelve Subjects, during the time I was busy upon the Ear: I have consulted many skilful Surgeons about it, and I may say, I have more than thirty Observations which they communicated to me, which makes it evident that this sort of Deafness is the most common and most curable. And that famous Surgeon of *Mons*, who has made so much noise in the World for curing Deafness, undertook none but this sort of Deafness: to know this, he turn'd his Patient's Ear to the Rays of the Sun, and when he discover'd any Obstruction in the Passage, he made use of a particular Instrument to clean it, and after this manner he cur'd a great Number of deaf People.

Causes a sort of Deafness easy to cure.

3d. *A Membrane.* There are sometimes Membranes form'd in the Inside of the Passage, which close it up exactly, and form a particular sort of Deafness. I have before, in my second Part, related that when I was examining

xamining the Reaſon of Deafneſs in a 'erſon of Merit after his Death, who ad been afflicted with it a long time, I ound in the right Ear, which was that 'ith which he could not hear at all, a ery thick and looſe Membrane, before 'hich there was a conſiderable Collection f Matter like Plaiſter, which was cer-ainly the cauſe of his Deafneſs; for he *Membrana Tympani* was in its natu-al State, and ſo were the other Parts of he Ear.

4. The fungous and fleſhy Excreſcences, 'hich ſometimes ſucceed Ulcers of this 'aſſage, or Excoriations which may be auſed by cleaning the Ear with too harp an Inſtrument, may fill it, and cloſe t up exactly.

4. *Fleſhy Excreſcences,*

5. There is another Sort of Obſtruction n the Paſſage, which is produced when ll the Glands which ſurround it are tu-nified, and are fill'd with an over-great Quantity of ſerous Matter, in the ſame nanner as we know the ſpongy Mem-ranes of the Noſe may be ſo much well'd, that they almoſt entirely ſtop ip the Paſſage of the Air: This Ob-truction is always accompanied with a Relaxation of the *Membrana Tympani,* ind from hence it cauſes a Deafneſs, or at

5. *By the Glands which ſurround it becoming tumified.*

Which is commonly accompanied with a Relaxation of the Membrana Tympani.

at leaſt a Thickneſs of Hearing, whic
diſſipates when this over-great Quantit
of ſerous Humours are evacuated by th
Ear, or by ſome other way, in the ſam
manner as all Catarrhs are cur'd.

Cure for the Obſtruction caus'd by extraneous Bodies, and the Extraction of them;

In the firſt ſort of Obſtruction th
whole Method of Cure conſiſts in ex
traneous Bodies: to ſucceed in this Caſe
we muſt firſt conſider whether they ar
Bodies that may grow ſofter, ſuch a
Peas, or whether they are hard and ſolic
ſuch as Leaden-Shot, Fruit-Stones, &
We muſt alſo obſerve whether theſe Bo
dies are enclos'd in the cartilaginous Paſ
ſage, or whether they are intangl'd in th
bony Paſſage. To extract ſoft Bodie
which are got no farther than into th
cartilaginous Paſſage, we muſt endeavou
to break them, or to introduce the Scoo
behind them, which may be effected i
a ſupple pliant Part, ſuch as the Carti
lage of the Ear is, and ſo draw them
out of the Paſſage. Hard Bodies alſo
which are in the ſame Place may be ex
tracted with the ſame Succeſs; and thi
may be done either with the Scoop o
the *Terebra*. As for thoſe Bodies whic
are in the bony Paſſage, it is extremely
difficult to extract them, as we have be
fore taken notice of, eſpecially when they
entirely

Which is perform'd by the Scoop, or the Terebra when they are enclos'd in the cartilaginous Paſſage.

etirely fill up the Paſſage; for then it is ey to conceive that neither the Scoop r the *Terebra* can be of any great Ser- ce. Therefore in this Caſe I recom- end the making an Inciſion into the ck-part and top of the Ear, which ay very ſafely be practis'd in this Place, here there are no conſiderable Veſſels, d where the Paſſage is cover'd with no- ing but a glandular Skin, as may be en in *Plate* III. *Fig.* II. By this means e partly avoid the Obliquity of the Paſ- ge, and make uſe of the *Terebra*; which beſt to uſe in the Extraction of Shot.

Or when they are contain'd in the bony Paſſage, it is effected by an Inciſion into the back-part of the Ear.

a Fruit-Stone ſhould be inclos'd in the ony Paſſage, as it may be taken hold f by one of its Extremities, becauſe it is f an oval Figure, we then may make ſe of the Inſtrument call'd *Tenaculæ*, eſcrib'd in the 4th Obſervation of the 1ſt. entury, and which, to ſpeak proper- , is but a double Scoop in the Form of incers: And for this Reaſon the Shanks muſt be made of a Plate of very fine teel to have a Spring, and muſt be ve- y thin. I ſhall not ſtop here to deſcribe ll the Circumſtances of theſe Opera- ions, nor to ſay it is neceſſary to drop ome Oil of ſweet Almonds into the Ear o relax the Paſſage; becauſe I ſuppoſe theſe

From whence we extract Shot with the help of the Terebra, *And Fruit-Stones with* Hildanus *his Scoop.*

theſe things are ſufficiently known.

Cure for the Obſtruction proceeding from the hardneſs of the Wax.

the ſecond Sort of Obſtruction, which occaſioned by the hardneſs of the Wa we muſt break it, and bring it away b Injections made with warm Water, emo lient Decoctions, Hydromel, Linſee Oil mix'd with ſome Drops of Spirits Wine; Oil of bitter Almonds, Oil ſweet Trefoil. Some make uſe of M neral Waters, and all Galls of Anima are commonly us'd, and that with goo Succeſs. There are ſome that pref warm Water to all other Liquids, an content themſelves with adding to it Dro of Spirits of Wine, to render it mo penetrating.

The Wax is looſen'd, and comes awa ſometimes in five Days, ſometimes at th Expiration of the fifteenth Day; whic plainly demonſtrates that we ought n to grow weary of continuing Injections.

For the Membrane which ſtops up the Paſſage.

In the third ſort of Obſtruction, whe there is commonly a Collection of Wa gather'd before the Membrane, which form'd contrary to the Courſe of Natur we muſt clean the Paſſage with the for going Injections, and afterwards pierce th Membrane; but Surgeons ought to tak care at the ſame time not to damage th *Membrana Tympani.*

Fo

For to have a true Idea of the Cure of the fourth Sort of Obſtruction which is form'd by fungous and fleſhly Excreſcences, the reading of *Fabricius Hildanus*'s firſt Obſervation of the third Century will be almoſt ſufficient; wherein he gives a Deſcription of a fungous and chirrous Excreſcence, which happen'd in the Paſſage after an Abſceſs. Before he extirpated it, he carefully prepar'd his Patient's Body; after that, he cut away as much as he cou'd by the Ligature: but as the Root of the Excreſcence was very deep, and as his Inſtruments cou'd not poſſibly reach the bottom of the Paſſage, he was obliged to make uſe of ſome Cauſticks, which he apply'd to it by the help of a ſmall thin piece of Wax, for fear of prejudicing the Paſſage, in which he very happily ſucceeded. To make this manner of treating theſe Diſeaſes more plain, we muſt take notice that if the *Fungus* is large, and protrudes out of the Paſſage, we may either cut it off with the Point of the Sciſſors, or of the Inciſion Knife; or elſe tye all that we can take up with a Ligature; but I think cutting it is the beſt way, becauſe in cutting it we take more of it away. As we are afterwards oblig'd to ſtop the Blood, we

For Excreſcences.

Of which we muſt extirpate as much as we can by the Ligature.

And conſume the Remainder by Cauſticks.

make use of a little vitriol Stone fix'd to a Quill in the form of a Crayon, so that there appears but a small Point of it out to hinder its touching any other Part but that where it is wanted, to stop the Blood by making an Eschar, which also takes away part of the *Fungus*, and to consume the rest which lies deeper in the Passage. As there must be a great deal of Caution us'd not to prejudice the Membrane by the Caustick, the most us'd of which are Powder of Savin, burnt Alum, red Precipitate mix'd up with Wax and Turpentine; I wou'd not chuse to make use of the small thin Pieces of the Wax, but I think the Caustick may be very safely apply'd in the form of an Unguent, at the end of a Tent, which may be introduc'd into the Passage, after we have plac'd a small leathern *Canula*, like the Finger of a Glove in it, into which we may easily push the Tent with the Unguent at the end of it, without being afraid of touching the Membrane which lines the Passage. Instead of Leather, we may make our *Canula* of Copper or Silver, which must be very thin, and curv'd in the same manner as the Passage is. After the Eschar is made, we must dress it up with some Drops of Oi

Which must be very carefully us'd, for fear they shou'd hurt the Membrane of the Passage.

o:

Eggs, or of Oil of ſweet Almonds,
much to give Eaſe to the Paſſage
o ſeparate the Eſchar: we muſt repeat
Application of theſe Medicines till
Fungus is conſum'd, and when it is,
muſt make Tents and ſpread them at
End with *Wourtz* Brown Ointment.
heſe Tents muſt be introduc'd, and puſh'd
yond the *Canula*, that the Ointment
y reach the reſt of that ſuperfluous
eſh, which remains in the Surface of
Paſſage, in which the *Fungus* was,
hinder it from ſprouting up afreſh,
d alſo to procure a good Digeſtion.
ter which we muſt make uſe of deter-
e and anodyne Medicines to incarn and
atriſe the Ulcer; always taking care
mix with them every now and then,
mething to ſtop the Regeneration of
e *Fungus*. A little Vitriol diſſolv'd in a
ficient Quantity of ſome vulnerary and
terſive Decoction, to give it a little Af-
ngency, is very fit for this purpoſe; we
y either inject it into the Ear, or paſs
little Lint dipt in this Liquor into it:
e Lint is the beſt Method when it may
eaſily introduc'd, becauſe it preſſes
on the Ulcer, and hinders the *Fungus*
om ſprouting up.

Cure of the Obstruction proceeding from the Glands being tumefy'd.

In the fifth sort of Obstruction, which is occasion'd by Tumefaction of the Glands of the Passage, the same general Remedies are prescrib'd, which are us'd in all other Colds: We fumigate the Ear with the Steam of Carduus, or of Decoctions of Florentine Orris, Sweet Marjoram, Carduus, Wormwood, Baum, Calamint, Aniseeds, Fennel, *&c.* The Decoction of Coloquintida in Oil is very much esteem'd. *Barbette* makes use of a Decoction of Cloves in red Wine, some of which he drops into the Passage, which must afterwards be stopt up with a Clove. We find in *Platerus*, a particular Water for this purpose, which is said to be very efficacious; there is another in *Mindererus*, which has been reform'd by *Zwelfer*, in his Remarks upon the *Ausbourg Pharmacopœia*, and we have a compound Spirit of Wine in *Amynsicht*. The Juice of Sweet Marjoram press'd out alone, is very much esteem'd: And the Urine of a Hare is very much commended by it self, or mix'd with Spirits of Wine, Aqua Water, and *Hungary* Water; it is also a good Method to keep the Ear stop'd with a little Cotton perfum'd with Musk. There are some People in whom the Membrane which lines the Passage, and

th

ne *Membrana Tympani* are so fine, that e cannot inject their Ear with these harp and spirituous Liquors; and then e must content our selves with dropping me upon some hot Bread, which may be eld upon the Ear. It is also a good Me-hod to hold these Liquors in the Mouth, ecause their spirituous Particles become evated, and pass thro' the Aqueduct to the Ear; and therefore for the same eason Masticatories are us'd with Suc-ess.

It is very easy to explain the Action f these Medicines, since all of them be-g of a subtile and penetrating Nature, ney open the Ducts of the Glands, and ake room for the Evacuation of the perfluous serous Humours. To this I all add an Observation, which was ommunicated to me by Mr. *Passerat*, very skilful Physician and Surgeon, of young Nobleman about eleven or velve Years old, to whom it frequently appen'd in the beginning of the Spring nd Autumn, that the Glands of the Pas-ge were swell'd in such a manner that ne Parts touch'd one another, and that was impossible to introduce any thing nto it. At first they us'd to drop some oil of sweet Almonds into the Ear, to

assuage the Pain, afterwards they mad use of a Decoction of Barley and Agri mony, which is detersive and desiccative and by this means, the Ear after havin discharg'd a Moisture which was almo like *Pus*, recover'd its pristine State.

The Diseases which the Membrana Tympani *is liable to, are, Relaxation.*

I come now to the Diseases of the *Mem brana Tympani*, which are Relaxation too great Tension, Schirrousnes and Rup ture. The Relaxation proceeds fro too great an Humidity, which moiste the Membrane; this Symptom commor ly accompanies that Obstruction of th Passage, which is produc'd by the swel ling of the Glands, which we have a ready describ'd, and contributes in a grea measure to the Thickness of Hearing, i those People who are subject to Fluxion from Catarrhs; and therefore, as Expe rience demonstrates daily, South Wind Fogs and Rainy Weather diminish th Sense of Hearing.

Too great Tension.

The extraordinary Tension of th *Membrana Tympani*, produces a quit contrary Effect; so that it makes th least Noises become insupportable: th Tension happens in violent Pains in th Head, and in acute Fevers, because th Tensions and Irritations of the Mem bran

branes of the Brain are communicated to all the neighbouring Membranes.

The Schirrousness of the *Membrana Tympani* proceeds from too great a Dryness, as it is visible in old People; and besides this, we know by an infinite Number of Observations, that the Membranes of the Body may become callous, and even bony: And this is what I have particularly observ'd in the *Dura Mater*, and in the Coats of many Arteries, which I have often found ossified; which may make us imagine that the *Membrana Tympani* may sometimes grow hard and cartilaginous, and so occasion an incurable Deafness. *Schirrousness.*

Lastly, The *Membrana Tympani* is liable to be ruptur'd either by some external Cause, as by an Ear-Picker, which we may push too far in without thinking of it, or by some Strain in shutting the Nostrils and Mouth, and forcing back the retain'd Breath with Violence; which Case happen'd to a Person of my Acquaintance. This Action of the Air is remarkable in Sneezing, in which we perceive that the Air which passes suddenly up the Passage, forces the *Membrana Tympani* outwards, and so causes a painful Tension. This may also *Ruptures.*

happen in Quincys and in Difficulties of Respiration, where the *Fundus* of the Mouth and of the Nose are swell'd by any Cold or Inflammation: for the Air which is driven out of the Breast not having the Liberty of passing out, forces it self into the Passage which leads from the Palate to the Ear with such Violence, that it is capable of lacerating the *Membrana Tympani*. *Tulpius* gives us two considerable Examples of this in his 35th Observation of his first Book. It is somewhat difficult to explain how the *Membrana Tympani*, which is so strongly inserted into a Groove, does not resist the Impulses of the Air; nevertheless, if we consider that this Groove is not continued in the whole Circle, but that it ends near the Place which answers to the Entrance of the Passage, which penetrates into the *Cavernulæ* of the *Processus Mammillaris*, as may be seen in *Plate* VII. *Fig.* II. and that at this Place the *Membrana Tympani* is only join'd to the Edge of the bony Passage of the Ear; it will readily be conceiv'd, that it may easily be forc'd out and disjoin'd at this Place; and by this afford a Passage for the external Air to enter in. We may perceive by this how greatly *Tulpius* is deceiv'd, when he imagines

Or at least Disunion from the Bone to which it was before united.

nagines that the Paſſage which paſſes om the Ear to the Palate contributes ot only to the renewing of the Air of ne *Tympanum*, but alſo affords a Paſge to the Air we breathe upon certain ccaſions; which Notion he has pretendl to eſtabliſh upon the Obſervation of oſe two Aſthmatick Perſons, we ſpoke f before, and upon the Opinion of *Alcæon*, who, from the Account of *Ariſtotle*, nagin'd that there were ſome Goats, who reathe through their Ears. Moreover, ne *Membrana Tympani* may be eroded y the Acrimony of the *Pus* which is tain'd in the *Tympanum*, or in the Inde of the auditory Paſſage; we find maY Examples of this in *Fabricius Hildaus*, *Schenkius*, and in many others. In hat manner ſoever the *Membrana Tympani* be broke, it happens that in ſhutng the Mouth and the Noſtrils, the ir comes out of that Ear with Noiſe, nd with ſuch a Force that it can extinuiſh a Candle. As for the Hearing, it preſerv'd for ſome time, but it inſenſily grows weaker, and is entirely loſt at ſt; which demonſtrates, when it is roke, that this *Membrana Tympani* is ot abſolutely neceſſary to hear with, and hat its principal Uſe is to tranſmit the

These Cauſes do not occaſion an entire Privation of the Hearing at first: But only ſometime afterwards.

Vibrations to the Air contain'd in th *Tympanum*, and to the ſmall Bones, an to keep off the Injuries of the externa Air. The external Air may alone ſuf fice to agitate the little Bones, and th immediate Organ, and excite the Senſ of Hearing; but as it deſtroys all th Parts of the internal Ear by its Coldneſs and its other exceſſive Qualities, it take away at laſt the Senſe of Hearing.

Cure of the Relaxation.

In the Relaxation of the *Membran Tympani*, we muſt uſe the ſame Remedie which are us'd in the Obſtruction pro ceeding from a Catarrh. In the Tenſio

Of the Tenſion.

beſides the Remedies proper for the Diſ tempers from which it is produc'd, w muſt foment the Ear with Milk, Oil o ſweet Almonds, or with ſome emollien Decoction: The Schirrouſneſs and Rup ture of this Membrane are incurable.

The Schirrouſneſs and Rupture are incurable.

The Diſeaſes of the Tympanum, *and of the Labyrinth, are*

As for the *Tympanum* and the *Laby rinthus*, as they are bony Parts cover'd only with a Membrane, I don't conceiv how they can be liable to any other Diſeaſe than to a Caries of the Bone, and to In flammation of the Membranes. Th

Caries of the Bones.

Caries of the Bone happens ſometimes af ter thoſe Abſceſſes of the auditory Paſſage which break in the back part of the Ear and then it hath been remark'd that

Fiſtul

ſtula hath been form'd above the *Pro-ſſus Mammillaris*, which hath penetrated to its *Cavernulæ*, and has caſt off in ales, the little *Laminæ* which compoſe em. This *Caries* is accompanied with very offenſive Smell, and with very id Symptoms, and it eaſily penetrates to the *Tympanum*, by the means of the aſſage which has already been ſpoken in the firſt Part, which deſtroying all e therein contain'd Parts, cauſe Deaf-eſs: But this very ſeldom happens; I ave had but one or two Examples of it.

Which may cauſe Deafneſs,

s for the Inflammation of the Mem-anes, I have often found in diſſecting e Ear, the *Tympanum*, *Veſtibulum*, the emi-circular Canals, and the *Cochlea* ll'd with thick Matter, which might roceed from ſome Abſceſs of the Mem-anes which line theſe Parts. I don't oubt but that this may be the Cauſe of eafneſſes, as well as the Collection of her Humours, which may be form'd all theſe Cavities: and what renders is Opinion more probable, is the Dif-culty there is in the diſcharging this Matter out of the *Tympanum*, becauſe its avity is ſituated lower than the Ori-ce of the Paſſage which goes from the ar to the Palate; and therefore theſe

Inflammation of the Membranes,

And Abſceſs of the Membranes.

Liquids can't fall into the Mouth without we bend down the Head in a particular manner: And before they can be discharg'd through the auditory Passage, they must first lacerate the *Membrana Tympani*, which they cannot do except they are very acrimonious. We may also suspect that the *Lamina Spiralis* may be eroded by the Acrimony of the Matter, and that it may even become too lax or too callous, much in the same manner as the *Membrana Tympani*, which I don't positively assert, never having had an Example of it.

Inflammation of the Lamina Spiralis.

Which may grow carious.

Cure of the Caries.

I can't recommend better Remedies in treating of the *Caries* of the Bone which happens in the Ear, than those which have been described by Monsieur *Deymier*, a very skilful Surgeon, from whom I had this Remark: At first he dilated the Entrance with a prepar'd Sponge which made a pretty considerable Opening, so that he cou'd apply his Medicines upon the carious Bones; after that he made use of Lint dipt in the imperial Water, in which he had dissolv'd a little Camphire; but as this incarn'd the Side of the Ulcer too soon, and the *Caries* remain'd still, he had recourse to *Euphorbium*

horbium in Powder, which he made uſe f with good ſucceſs; this produc'd ſome ittle ſmarting but light Pains, which id not laſt long. The Uſe of this Pow- ler produc'd the deſir'd Effect, that is to ay, the Exfoliation of the Bone, in ıindering the *Fungus* from ſprouting up. He made uſe alſo of *Euphorbium* in a Tincture with Spirits of Wine, to which ıe added ſome Myrrh and Aloes. The *Caries* being thus conſum'd, and the Bone exfoliated, he return'd to the Uſe of the mperial Water, till he made a perfect ınd entire Cure of it; and over the Lint ıe apply'd the Plaiſter of *Janua*, to which he added the Eſſence of Juniper and of Cloves, and a little Oil of Marigolds.

Cure of the Inflammation of the Membranes.

In the Inflammation of the *Tympanum*, and of the *Labyrinth*, topical Remedies are almoſt of no effect; in this Caſe we muſt keep to the internal and general Remedies, which alſo have no better Succeſs, becauſe the Abſceſſes break out in the Inſide of the *Tympanum*, and of the Cavities of the *Labyrinth*, from whence the Matter can't poſſibly be diſcharg'd: ſo that theſe Humours being collected together in theſe Cavities, occaſion an incurable Deafneſs.

The

The Diseases of the auditory Nerve.

The Diseases of the auditory Nerve are Obstructions and Pressure, when the whole Brain is overflow'd by serous Humours in an Apoplexy, and in any Palsy, it is evident that the Nerve will be obstructed in the same manner as the others are. Besides this, we may easily conceive that the Obstruction of the Nerve alone, without any other Fault in the Organ of Hearing, may occasion a Deafness, in the same manner as the Obstruction of the optic Nerve produces a *Gutta Serena*. A Pressure upon the Nerve produces the same Effect; it proceeds from many Causes, as from the Blood and from other extravasated Fluids, as we find in the greatest Number of Apoplexies, or from any Tumour. I find an Example of this last Case in Monsieur *Bonnet*, a celebrated Physician of *Geneva*, in his first Book of practical Anatomy, the 53d Observation of the second Section; which relates, that Mr. *Drelincourt* found in the Brain of a Man that had dy'd of an Apoplexy, a *Steatoma* between the *Cerebrum* and *Cerebellum*, which at first caus'd a Blindness, afterwards a Deafness, and lastly, an entire Privation of all the animal Faculties.

Obstruction,

And Pressure,

Which may proceed from Tumours happening upon the Brain.

It

It is eaſy to know this Obſtruction, or this Preſſure upon the Nerve, in the Eye where all the Parts are tranſparent and diaphanous; for when there is no Fault to be perceiv'd in theſe Parts, we have reaſon to ſuſpect ſome Obſtruction of the optic Nerve; but in the Ear all the internal Parts are hid from our Sight, ſo that we can ſcarcely judge whether the Fault is in the Organ, or in the Nerve. Nevertheleſs, if any Stupor or Palſy has preceded this Deafneſs, or elſe if there is any other Senſe taken away at the ſame time, we may reaſonably ſuſpect that the Brain is affected, and the Nerve alſo, by Obſtruction or by Preſſure. In this Caſe, we muſt preſcribe the ſame Remedies which are us'd in Palſies, frequent Purges, Emetics, cephalic Waters and Spirits, Sudorifics, Baths, Maſticatories, and Sternutatories, *&c.* The Preſſure which is caus'd by ſome Tumour is incurable.

It is difficult to know whether the Deafneſs proceeds from any Fault in the Nerve, or from any Defect in the Organ.

The Diſeaſes which have been explain'd hitherto, take away quite or diminiſh the Senſe of Hearing; but the Noiſe in the Ear is a Depravation of it; this Depravation conſiſts in rendering the Ear ſenſible of Noiſes which are not in reality, or which are not external; ſo that it

The Noiſe in the Ear is a Symptom, the Cauſes of which are difficult to explain.

it being already attentive to one Sound, it is less capable of receiving the Impressions of external Sounds, except they are extremely violent.

The Ancients attributed it to the implanted Air.

The Ancients imagin'd that the true Reason of the Symptom consisted in the Motion and Agitation of the implanted Air in the Ear. They related that this Agitation was commonly caus'd by Winds and Vapours which came into the Ear from all the whole Body, as it happens in some Fevers, or from some Part of it, as from the Stomach or the Brain; or that it proceeded from some pituitous Fluid inclos'd in the Cavities of the Ear; they wou'd also have explain'd all the different Sorts of Noises in the Ear by the Quality, the Consistence, and the Motion of the Fluids, or Air, which are collected in the Inside of the Organs of Hearing. I shall not stop here to take notice of all that may be defective in this Explanation, one may judge pretty well of it by the Idea that I shall give of this Noise in the Ear; I shall content my self with saying, that there is no Appearance that these different Sounds, which they imagine we hear, are caus'd by any thing which in reality strikes upon the Ear, to produce the Sounds of Bells, murmurings of Waters,

and

a] an infinite Number of other Sounds, nich Perſons ſubject to theſe Noiſes in t: Ear are every day ſenſible of, and tit it is credible, that the moſt part of teſe Buzzings in the Ear are but falſe ounds, and that theſe Appearances of loiſe may be produc'd without any Vind being in the Ear, or without Mat- which ſtrikes the Membranes external- , which compoſe the immediate Organ Hearing, as I am going to explain it.

It is my opinion, that the Noiſe in the ar, conſiſts in the Perception of a ound which is not in reality, or of an ternal Sound. To explain how we n be ſenſible of a Sound which is not reality, we muſt take notice that ie Action of Hearing conſiſting in Vibration of the immediate Organ, it ſufficient that this Vibration be excited cauſe a Sound, without it's being neceſ- ry that this Motion be produc'd by the ir; for in the ſame manner that we con- ive, how Viſion, which depends on ie manner in which the *Retina* is agi- ted by the viſual Rays, may be per- orm'd without theſe Rays, when this Agitation is produc'd from any other Cauſe, as it happens when the Eyes ſee Sparks of Light in the dark, after hav-

It is more reaſonable to believe that it is commonly produc'd by the Vibration of the immediate Organ.

ing

Which is produc'd by Causes enclos'd in the Membranes of the Organ.

ing receiv'd a Blow: we may alſo ſa that when any other Cauſe than the ag tated Air produces in the Organ of Hea ing, I mean the Inſide of the Subſtan of the Membranes, this Agitation, whic is regulated in the ſame manner, that commonly is by the Air which brin the Sound; the Ear ſeems to be ſtruc by a Sound which in reality is r more than the Light of the before-me tion'd Sparks is a true Light. But wh renders this Compariſon pretty juſt, i that as theſe falſe Appearances of Ligh which are not caus'd by external Ob jects, have nothing in them diſtinct an particular, but only a ſimple Light the Sight of a more complex Objec requiring the Concurrence of too man Things: So it ſcarce ever happens, tha the Noiſes in the Ear which we are treat ing of, have any Sound but what is cor fus'd; the Whiſtling and Tinkling which are the moſt diſtinct Noiſes in thi Symptom, being but meer Sounds.

Which may be attributed to the Diſeaſes which produce this Symptom.

For to determine what can be th Cauſe of this Agitation in the immediat Organ, we muſt examine the Diſtem pers in which theſe Noiſes are found theſe Diſtempers are Inflammations an Abſceſſes in the *Tympanum* and *Laby rinth*

nth, and the Diseases of the auditory assage. Inflammation and Abscesses in ie *Tympanum*, and in the *Labyrinth*, ecessarily cause Vibrations in the *Lami-a Spiralis*, and in the Semi-circular Canals, either by the Tension of the Membranes, or by the Vapours which erspire, and are mix'd with the Air i the *Tympanum*. Sharp Humours, Worms, extraneous Bodies, the Con-raction of the Passage which succeeds he Swelling of the Glands, and in ge-eral every thing that causes Pain, and he other Symptoms in the auditory Pas-age, which I have before described, a-gitate the Membrane of the Passage, and he *Membrana Tympani*, which is suffi-ient to communicate this Agitation to he immediate Organ.

Sometimes the Noise in the Ear proceeds from an external Impulse; As when we stop our Ears with our Hands.

The second sort of Noise in the Ear s that in which we perceive a true, but in internal Sound. It is thus, we per-ceive a Buzzing when we stop our Ears; his Noise is caus'd by the Friction of the Hand, or by the Pressure which rumples the Skin and the Cartilages, whose Par-ticles may occasion Agitations in this Place; the Elasticity of the inclos'd Air, and the Vapours which incessantly pro-ceed from Bodies, may also contribute to them,

them, when those Vapours which proceed from the Hand, join'd with those which come from the Membrane of the Passage, being confin'd, strike upon the *Pariete.* of the Cavity, and produce Vibrations; which though they are very small, yet they form a true Sound, which becomes sensible from the Proximity and Continuity of the Parts, and also by the help of the Reflections which are form'd in this inclos'd Cavity.

The Diseases which cause this sort of Noise in the Ears, are, The Commotions of the Cranium.

The Commotions of the *Cranium*, and the Distempers which contract the Passage, may cause such sort of Noises in the Ear, if we suppose that the Shocks the whole *Cranium* receives, are communicated to the immediate Organ only by the Continuity of the *Os Temporale*; I mean, at the very Time of the Commotion: for as for those which afterwards succeed, they must be attributed to the Disorder of the Spirits, as we shall see in the Sequel. In the same manner, the swelling of the Membrane of the Passage may, in contracting it self, produce a like Effect. Besides this, it often happens that we perceive a Pulsation in the Inside of the Ear, which makes us believe that we hear something beat, and this Pulsation is sometimes so strong, that other

The beating which we imagine we hear in the Inside of the Ear is caus'd by The Contraction of the auditory Passage.

People

eople may hear it. I have made an Obrvation upon this, of a Lady of *Picardy*, ho upon the leaſt violent Exerciſe perciv'd ſo troubleſome a Pulſation, that ſeem'd to her that ſhe had a *Pendulum* x'd to her Head, and this Pulſation was lſo heard by thoſe who came near her. low this beating is nothing elſe but that f a dilated Artery, becauſe it always erfectly agrees with the beating of the Heart; and this Perception of an internal ound, appears to me abſolutely like that ymptom which is obſerv'd in imperfect uffuſions. Thoſe Perſons who are iz'd with this Diſorder, ſee Motes and lies flying before the Objects; theſe Motes and Flies are nothing elſe but the iſcous and groſs Particles which begin o be amaſs'd in the aqueous Humour, hich by their Motion agitate the *Retina*, and neceſſarily produce a Senſation. ut, ſay they, if theſe are true Noiſes, nd if the Organ diſtinguiſhes them ſuch as hey are, why are they put in the Number f tinkling Noiſes in the Ear? I anſwer, hat in reality theſe Noiſes are perceiv'd uch as they are, but that the Hearing is leprav'd in miſtaking theſe Noiſes as oming from ſome external Object, in the ame manner that thoſe who have a Cataact beginning to be form'd, imagine

And by the Pulſation of a dilated Artery.

theſe

theſe Appearances of Motes and Flies t
be exernal Objects, and put out the
Hands to catch him.

The immediate Vibration of the Extremities of the nervous Fibres, to their Origin in the Brain, may cauſe all the Appearances of Noiſes.

Beſides this, I imagine there may be
Perception of a falſe Noiſe without any D
fect in the Organs of Hearing: Whic
happens every time that the Parts of th
Brain, where the Filaments of the auditor
Nerve terminate, are mov'd and agitate
in the ſame manner that they us'd to b
vibrated by Objects. What induces m
to believe this, is, that I take notice of
great Number of Diſeaſes of the Brai
which are accompanied with a Noiſe i
the Ear: As for example, Deliriouſneſ
Phrenzy, Vertigoes, and thoſe Perſor
which fall into Epilepſies and Swooning
perceive theſe buzzing Noiſes in the
Ears, which are as the Præcurſors of Pa
roxyſms. As there is an irregular and ex
traordinary Motion of the Spirits in a
theſe Diſtempers, it is much eaſier t
imagine that the agitated Spirits ma
ſtrike upon the Extremities of the auditc
ry Nerve, and ſo by this means cauſe
Senſation of Noiſe, than to imagine tha
there is a Defect in the Organs of Hea
ing. This manner of explaining th
Noiſe in the Ear, appears to me reaſor
able enough; and methinks we may adc
tha

t as the Motion of the Spirits is very
egular and diſorder'd in all theſe Diſ-
mpers, ſo the Sounds and Noiſes in
: Ear muſt in this Caſe be very con-
f'd and very different from the Sounds
hich we commonly hear. I ſhall with-
t doubt be told, that this is a falſe Ima-
nation, and not a Symptom of the Ear.
gree to it, and this is what I alledge:
; it is thought that we can never hear
thout the Ear is ſtruck upon, we attri-
te all Noiſes to this Organ; nevertheleſs
is indifferent whether the Fibres of the
erves be ſhaken next the Ear, or next
e Brain, there will ſtill ariſe the ſame
nſation from it: and this is caus'd in
e ſame manner as in the Vertigo, in
hich we know that the circular Motion
Spirits alone produces the ſame Effect
if the viſible Objects had really this ro-
tory Motion; or in frantick Perſons, who
ncy they ſee Motes which are not in
ality, which is caus'd only by the Agi-
tion of the Fibres of the optic Nerve in
e Inſide of the Brain. As they alſo at-
ibute the Symptoms of Suffuſions and
hrenzy to a deprav'd Imagination, we
uſt attribute the Noiſes in the Ear, which
icceed the Diſtempers of the Ear, to the
me Cauſe, although they very often

Which are not ſo much a Symptom of the Diſeaſes of the Ear.

don't

don't in any manner depend on the Indif positions of the Organ of Hearing.

As of those of the Brain, which produce a second sort of Noise in the Ear.

We may after this manner lay down two Sorts of Noises in the Ear, one o which proceeds from the Disorders of th Brain, the other from the Disorders o the Ear; those which succeed the Dif orders of the Ear are, as aforesaid, ei ther true or false; and of these some ar call'd Tinklings in the Ear, other Whistlings, others Buzzings, others Mur murings, *&c.* And in general we ma say, that the hollow and buzzing Noise are produc'd by a slow Vibration, an the Whistlings and Tinklings by a clos and strict Vibration, which is confirm' by the remote Causes of these Symp toms: Colds, for example, and Suppura tions, in which the Membranes are re lax'd, commonly produce a Buzzing and Inflammations and Pains in the Ear in which these Parts are commonly tens and dry, Whistlings and Tinkling: We must also believe, that all these Noise make the same Impression upon the *La mina Spiralis*, and upon the Semi-cir cular Canals, as grave and acute Sounds

The Cure of the Noise in the Ear ge nerally depends upon the Diseases of th

Brain

rain, or of the Ear which produce it. To this I add, that in the Whiſtlings nd Tinklings we muſt make uſe of ve- y nigh the ſame Remedies, as thoſe hich have been deſcrib'd in ſpeaking of ne Pain proceeding from Heat, and of ne Tenſion of the *Membrana Tympani*; nd that in the Buzzings we may make ſe of thoſe which have been preſcrib'd or the Pain which is occaſion'd by old, and for an Obſtruction proceed- g from a Catarrh. After which, it will e no difficult matter to chuſe the moſt onvenient, if we conſider the Circum- ances which may afford us the neceſſa- y Indications for the Cure.

The Cure of the Noiſes in the Ear, is the ſame as that which is us'd for the Diſeaſes from which they are produc'd.

FINIS.

A

GENERAL TABLE

OF

The Organ of Hearing.

PART the First, containing the Structure of the Organ of Hearing.

THE external Part of the Organ of Hearing call'd only the Ear, Page 1. *is compos'd of a Cartilage*, 2. *of Skin, of Fat, of a nervous Membrane, of two Muſcles*, id. *of Arteries*, 4. *of Veins*, 5. *and of Nerves*, 6. *The Hole of the Ear is divided into two Parts*, 1ſt. *The cartilaginous Part, which is broke off in many Places*, id. *and cover'd with a Skin, adorn'd with many little Glands*, 8. *and is connected to the* Os Temporum *by a Ligament*, id. 2dly, *the bony Part*, 10.

The cartilaginous and bony Part form the auditory Paſſage, id.
The external Part of the Organ of Hearing is ſeparated from the internal, by the Membrana Tympani, id.
The firſt Cavity of the internal Ear call'd the Tympanum *or* Drum, 16. *has five remarkable Things in it, 1ſt. Two Paſſages, one of which paſſes into the Palate*, 18. *the other into the* Cavernulæ *of the* Proceſſus Mammillaris, 22. *2dly. Two* Apertures *or* Feneſtræ, id. *3dly. Four little Bones, the* Malleus, 25. *the* Incus, 26. *the* Stapes, 27. *the fourth little Bone*, 28. *4thly. Three Muſcles, two of which belong to the* Malleus, viz. *the External*, 29. *and the internal Muſcle*, 30. *and one to the* Stapes, ib. *5thly. A Branch of a Nerve*, 31.
The ſecond Cavity of the internal Ear call'd the Labyrinth, is divided into three Parts, id. *1ſt. The* Veſtibulum *which has nine* Foramina, 32. *2dly, The three* Canales ſemi-circulares, viz. Canalis ſemi circularis Superior, 33. Inferior, id. Medius, id. *3dly, The* Cochlea, *in which two Things are to be taken notice of*, viz. 39. *1ſt, The ſemioval Canal*, id. *2dly, The* Lamina Spiralis, id. *Which is fix'd to the Canal by*

by a very fine Membrane, 40. *and which divides the Canal into two*, id. *and 3dly, The Arteries and Veins of the* Cochlea, 41. *and of the* Vestibulum, id. *4thly. The implanted Air*, 42.

The other Parts of the Organ of Hearing, are the Canal of the auditory Nerve, id. *The* Nervus Auditorius *is divided into two Branches*, viz. *The* Portio Mollis, 43. *which is divided into three Branches, the largest of which is distributed into the Axis of the* Cochlea, id. *The two other Branches into the* Vestibulum, *and into the semi-circular Canals*, 49. *the* Portio Dura, 50. *which produces as it passes out of the Cranium, a Ramification which is expanded over the back part of the Ear*, 51.

The Chorda Tympani *is a Nerve which is a Branch of the fifth Pair*, 53. *which is join'd to the Trunk of the* Portio Dura, id.

The second vertebral Pair furnishes a Branch to the Ear, 55.

There are many particular Things in the Ear of a Fœtus, 57. *1st. That part of the auditory Passage which is bony in Adults, is nothing but a Membrane in the* Fœtus, id. *2dly, There is a Circle which is not entire*, 59. *it is hollow in the Inside like a Gutter*, 60. *This Cir-*

cle is united to the bony Canal in Adults, id. *it has the same Plan in the* Fœtus *as in the Adult*, 61. *3dly, The Aqueduct is almost entirely membranous*, id. *4thly, The* Membrana Tympani *is cover'd with a mucilaginous Matter*, id. *5thly, The superior Semi-circular Canal, and a Portion of the Inferior, are visible without any Dissection*, id. *6thly, There is a* Fossa *and* Foramen *in the* Os Petrosum, 62. *7thly, The scaly Part of the temporal Bone is separable from the* Processus Mammillaris, *which is very minute*, id. *8thly, The* Officulæ *and the Labyrinth are pretty nigh the same size in the Adult, and in the* Fœtus, id.

The Trunk of the Portio Dura *has two principal Branches, which are divided into many Ramifications*, 63. *The Ramifications of the first Branch are distributed to the Muscles of the Forehead, Temples and Eyelids, and pass into the Orbit*, id. *They also go to the Muscles of the Nose and Lips*, id.. *And to all the Integuments of the Face*, 64.

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OF

The Organ of Hearing.

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THE mechanical Structure of the Organs of Hearing, serve to discover the Use of them, Page 67.

The external Ear performs the Office of the Trumpet, which deaf People make use of, 68. *Its Folds serve to augment the Force of the Air, which acts upon the Organs by the Refractions which they cause*, 69.

The Muscles of the external Ear serve to contract and dilate it, id.

The Obliquity of the Passage is proper to preserve the Membrana Tympani *from the Injuries of the Weather, and to render the Vibrations stronger by doubling its Refractions*, id.

The Wax stops extraneous Bodies, which might impair the Membrana Tympani, 70. *it may also be prejudicial to the Ear, when*

when it is too thick and in too great quantity, id.

The Membrana Tympani *is neceſſary for the Preſervation of the other Organs*, 71. *It is extended by the Muſcles of the* Malleus, 72. *The Will is not the Cauſe of theſe Muſcles acting, but the different Diſpoſitions of the Objects*, 73. *and according to the Occaſions which concur*, 74. *The* Membrana Tympani *is more or leſs relax'd according to the Diverſity of Sounds*, id. *Which it does in putting on their Characters, by mechanical Motions which are difficult to explain*, 75.

The Agitation of the Membrana Tympani *is communicated to the other Organs of Hearing, not ſo much by the Help of the Air, which is in the Cavities of the Ear*, id. *as by the Aſſiſtance of the little Bones, which agitate the Labyrinth, and the Air which is inclos'd in it*, 76.

The Muſcle of the Stapes *ſerves to extend the Membrane, which is fix'd to its* Baſis, 77. *and to extend the* Stapes *it ſelf*, id.

The Paſſage of the Proceſſus Mammillaris *affords a Paſſage to the Air when it is over-preſs'd in the* Tympanum, 78.

The Aqueduct ſerves to bring the Air from without to it, and to renew that which is

is in the Tympanum, id. *and not to supply the Office of the* Membrana Tympani, 79.

The Feneſtra Ovalis *communicates the Vibrations of the Air to the Labyrinth*, 80.

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The immediate Organ of Hearing conſiſts of two Parts, which compoſe the Labyrinth, id. *the firſt of which is the* Cochlea, id.

The Lamina Spiralis *is eaſily vibrated*, id. *1ſt. Becauſe of its Subſtance*, id. *2dly. Becauſe it is very much extended*, 82. *3dly. Becauſe in dividing the Semi-oval Canal into two* Scalæ, *it receives Pulſations from the upper and the under one*, id. *4thly. Becauſe its ſpiral Figure is the Cauſe of its being vibrated in many Places*, 83. *5thly. This* Lamina *receives all the different Vibrations of the Air, becauſe of its unequal Figure*, id.

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The Cochlea *is not to be found either in Birds or in Fiſhes, the Semi-circular Canals alone perform the Office of the immediate Organ in theſe Animals*, 85. *There are Nerves and Membranes which are*

are the Cauſe of theſe Semi-circular Canals, forming part of the immediate Organ, id. *Their Windings ſerve to augment the force of the Air, by the Refractions which they cauſe*, id. *Theſe Canals receive the different Characters of Tones as well as the* Lamina Spiralis, 86. *becauſe they are made like Trumpets*, 87. *and their Subſtance is eaſily vibrated*, id.

It is by the Communication of the auditory Nerves with thoſe of the Voice, that the Sympathy between the Voice and the Hearing is caus'd, 88. *and by the Communication of the ſecond vertebral Pair, that the Affinity that there is between the Tones of Hearing and the Motions of the Body are produc'd*, 89. *and that of the Pulſe*, id.

OF

OF

The Organ of Hearing.

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The

The different Solutions of Continuity cause the different Sensations, 95. *of pungent Pain*, id. *of Erosion*, id. *of Tension, of Weight, of Pulsation*, id.

This Pain is very violent, 96. *because the Membrane of the Passage is compos'd of a fine nervous Texture*, id. *and receives a great number of Nerves*, id. *and is fix'd close upon the Bone*, id. *and connected with other very sensible Membranes*, 97. *And this often causes an acute Fever*, 98. *by the Agitation of the Spirits*, id. *and by the Fermentation of the Blood*, 99. *A Watchfulness*, id. *Delirium*, 100. *Convulsions*, id. *and Swooning*, id. *A History upon this Subject*, 101. *Remarks upon this History*, 102.

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e Causes of the Suppuration and the Flux of Blood, which apparently does not come from the Brain, 109.
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ure of the Obstruction caus'd by extraneous Bodies, and the Extraction of them, 118. *which is perform'd by the Scoop, or the* Terebra, *when they are inclos'd in the cartilaginous Passage*, id. *or when they are contain'd in the bony Passage, it is effected by an Incision into the back part of the Ear*, 119. *From whence we extract Shot with the* Terebra, id. *and Fruit-Stones with* Hildanus *his Scoop*, id.

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Cure for the Obſtruction proceeding from the Hardneſs of the Wax, 120. *For the Membrane which ſtops up the Paſſage*, id. *for Excreſcences, of which we muſt extirpate as much as we can by the Ligature*, 121. *and conſume the Remainder by Cauſticks*, id. *which muſt be very carefully us'd, for fear they ſhou'd hurt the Membrane of the Paſſage*, 122.

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The Cure of the Noises of the Ear, is the same as that which is us'd for the Diseases from which they are produc'd, 145.

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332 **Du Verney** (Joseph-Guichard) A Treatise of the Organ of Hearing: containing The Structure, the Uses, and the Diseases of all the parts of the Ear. Translated from the French (by John Marshall). London, S. Baker, 1737 £7 10s

8vo. New calf. 12, 145 pp.; 7 ll. With 16 fine folding plates.

FIRST ENGLISH EDITION.

No copy in the Osler Library.

The first scientific treatise written on otology and important for the anatomy of the ear. The author (1640-1730) was professor of anatomy in Paris.